MARCH 1960

Traffic Safety

A NATIONAL SAFETY COUNCIL PUBLICATION

The Challenge of Off-the-Job Safety

QUARTERLY RESEARCH REVIEW

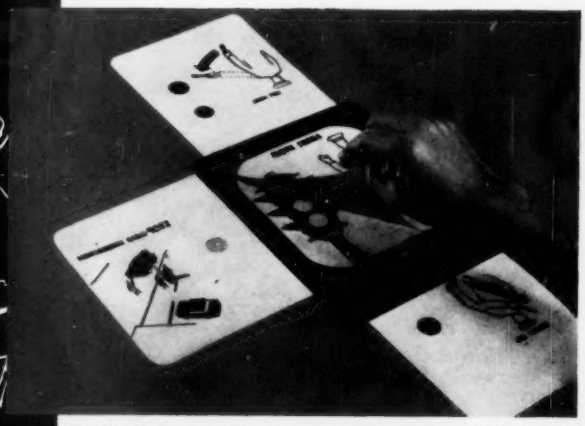
TRAFFIC FACTS for 1959

THE DEATH TOLL

THE TRAVEL PICTURE

THE ACCIDENT COSTS

THE DRIVER SAFETY ANSPARENCY SERIES



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MAIL BAG

Spreading the Message

Just thought you would like to know that we in the Delaware Safety Council are providing the members of the Joint Safety Committee of the Delaware Senate and House with subscriptions to TRAFFIC SAFETY magazine.

We are also going to provide subscriptions for the members of the State Highway Commission and the members of the Delaware Interstate Highway Division, Delaware Memorial Bridge.

We like your magazine and feel that it will be exceptionally helpful to these devoted gentlemen who voluntarily give much of their time and ability to supervising these official state departments.

J. JAMES ASHTON
Manager, Delaware Safety Council

He Agrees

May we compliment you for the excellent article, "Let's Stop Talking About Highway Hypnosis," by Edwin L. Baron, which appeared in the December issue of TRAFFIC SAFETY.

The writer very much appreciated having some of his long-formed personal opinions on this subject of highway driving fatigue confirmed by a person qualified on the subject of hypnotism.

HOWARD K. GANDELOT
Engineer in Charge,
Vehicle Safety Section
General Motors Corporation

Praise from Old Pro

I was much impressed with Erwin D. Canham's article in your February issue of TRAFFIC SAFETY.

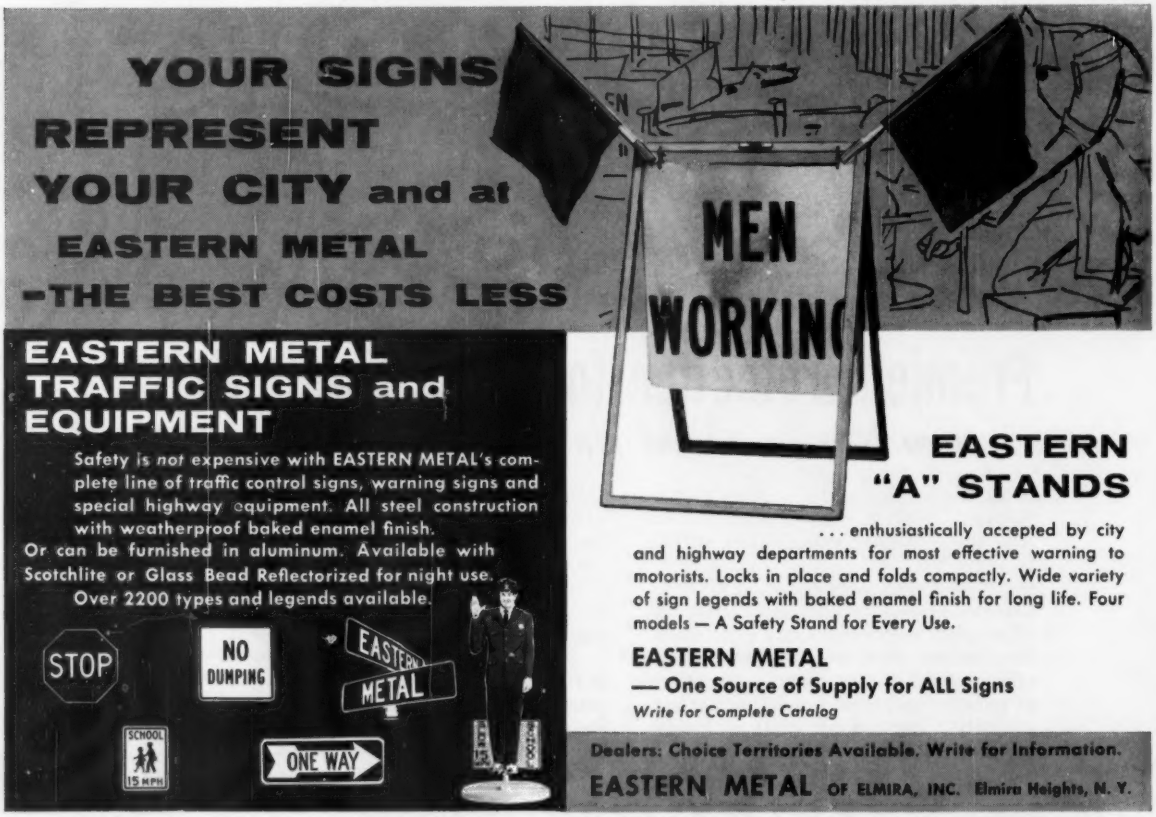
The article reminded me of the Council's co-operation with Chief Justice Vanderbilt of New Jersey and his efforts in court reform. Judge Harold Medina in his book, *The Anatomy of Freedom,* has this to say about Vanderbilt's work: "The effect in New Jersey has been almost unbelievable. With 20 per cent fewer judges after the new constitution of 1948, 90 per cent more cases were disposed of in the first year of operations and an additional 20 per cent in the second year. Practically all the dockets were brought up to date and delays in disposition of cases disappeared."

It may be that you have already given publicity to this significant accomplishment.

This whole February issue of TRAFFIC SAFETY has been of great interest to me, and I congratulate you on your continuing efforts to diminish traffic accidents.

W. H. CAMERON
Evanston, Ill.

[*Will Cameron, one of the nation's pioneers in organized safety, needs no introduction to safety veterans. He helped found the National Safety Council and was the Council's managing director from 1913 until 1942. In retirement, he continues to take an active interest in the progress of accident prevention.*]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Traffic Safety

Volume 56 Number 3 March 1960

A NATIONAL SAFETY COUNCIL PUBLICATION

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TRAFFIC SAFETY is dedicated to the prevention of traffic accidents through the presentation of objective information and responsible opinion to official agencies, public support groups and the motor transportation industry. The views expressed do not necessarily reflect the beliefs or policies of the National Safety Council, but they are presented in the conviction that the pressing social problem of traffic accidents can best be resolved through freedom of expression and open debate.

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BETWEEN STOPS

FEW of us have the ability to understand the meaning of 39,000 auto deaths a year.

Is this callousness? Not at all. The strain on our sanity would be unbearable if each death became a personal tragedy.

But once in a while the death of one man can bruise the heart of a whole generation. The anguish of his dying becomes a deeper sorrow so that his face is repeated over and over on the thousands of anonymous bodies who died as he did.

Then, the numbers have a sudden, sad meaning.

Albert Camus—Nobel Prize-winner and a leader of the French Resistance, journalist and novelist, actor, director and dramatist, a clear voice of reason in our era—is dead in an automobile crash. The train ticket to Paris which he decided at the last minute not to use was still in his pocket.

He was 46.

Today's Traffic

LOOKING AHEAD

Virginia does it again

Virginia came through 1959 with a slight reduction in traffic deaths and the lowest traffic death rate in the state's history. During 1959 the state received six awards for its outstanding performance the previous year. Thirty-one Virginia cities also won awards for their 1958 records.

Bikes go to college

Two and three quarter million students in the U.S. depend on bikes for school transportation. A recent survey by the Bicycle Institute shows a high incidence of college riding. For example, there are 1,000 bikes at U.C.L.A., 3,200 at the University of Florida, 1,000 at Vassar, 1,500 at U.S.C., 4,500 at the University of Michigan, and 3,150 at Michigan State.

Driver gets transported

The driver of a Cincinnati auto transport thought the day of the electronic-brain car had arrived when he watched an automobile with fogged-up windshield detach itself from its traffic lane, climb the ramp of his parked transport and perch atop the rig. But there was an explanation. Behind the windshield sat Miss Sharon Cipollone. She told police that she couldn't see out, hence didn't see the transport.

Parking costs going up

The five cent parking meter is becoming a thing of the past according to the American Municipal Association. Of 48 large cities recently surveyed by the San Francisco Parking Authority, 38 charge 10 cents an hour or more in at least some areas. Four charge 10 cents an hour for all meters. Five charge 20 cents an hour for some. The cities reported no apparent dissatisfaction with rate rises.

Safety belts to rescue

A Salt Lake City man credits safety belts with saving the lives of his wife and himself in an unusual accident. A deer jumped in front of their car when they were driving on U. S. 84, and rolled under the vehicle, throwing it out of control. "The car rolled over about four times and stopped upside down with my wife and I hanging head down from our safety belts," the driver said. "If it hadn't been for those belts it would have been a fatal accident."

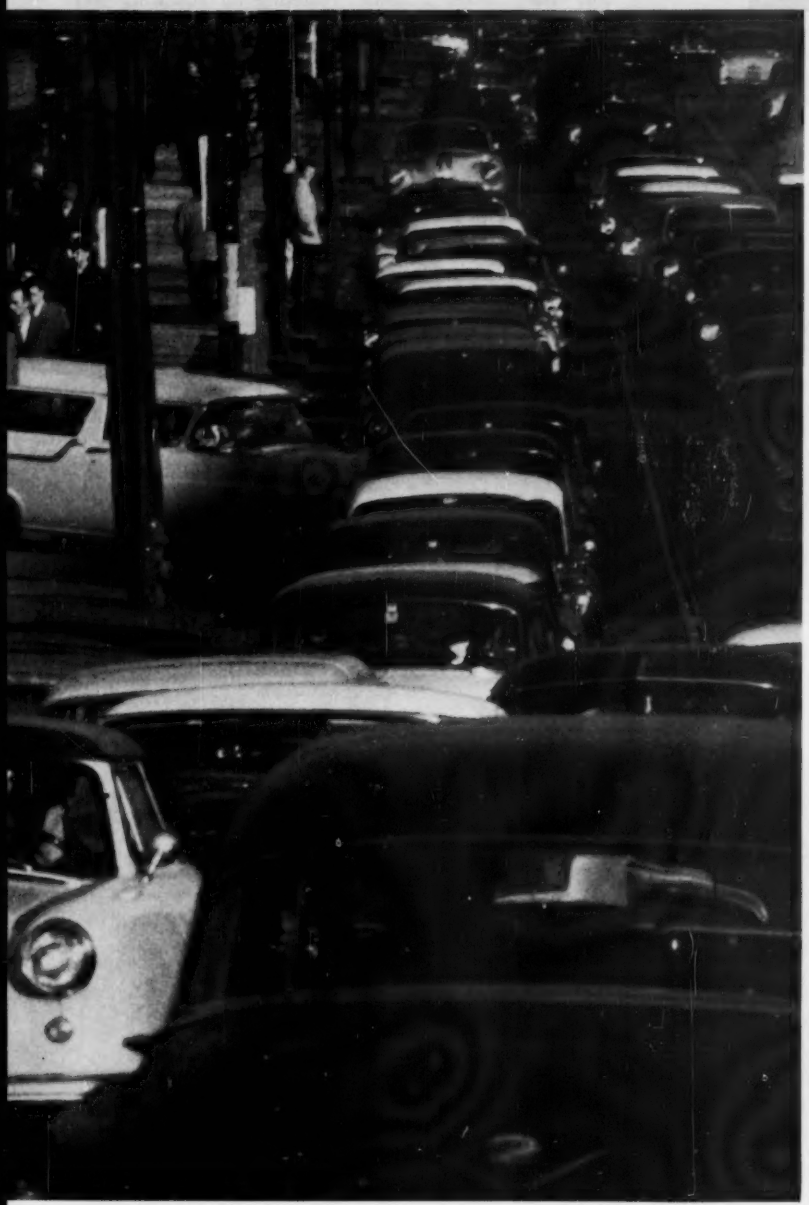
Kiss-and-drive motorist freed

Magistrate Daniel Grosso of Vineland, N. J., dismissed the case against a man accused of kissing his fiancee while driving. The defendant admitted that the girl had kissed him discreetly on the cheek while the car was in motion. But he said he didn't return the kiss, and his hands did not stray from the steering wheel.

TRAFFIC FACTS FOR 1959

Deaths and travel up. Rate at all-time low.

by H. Gene Miller



TRAFFIC deaths throughout the nation increased in 1959 as travel zoomed to an all-time high.

The death toll was 37,800, a modest 2 per cent increase over the 1958 toll of 37,000. Although 1959 deaths were 800 more than in 1958, they were 900 less than in 1957 and nearly 2,000 fewer than in 1956.

The increase in deaths in 1959 was less than half of the five per cent increase which occurred in motor vehicle travel. Because of the smaller increase in deaths, the mileage death rate decreased again to an all-time low of 5.4 (deaths per 100 million vehicle miles) compared with 5.6 in 1958. Annual death rates have increased only twice since the war, and each of these increases was just .1.

Deaths were higher during the first seven months of the year, with increases ranging up to 7 per cent in May and 8 per cent in March. From August through November, deaths were unchanged or down, while in December the total moved up 2 per cent.

The steel strike undoubtedly had an influence on the accident experience in the latter months of the year, but since the rising trend of travel was slowed only slightly during these months, credit for the improvement also must go to traffic enforcement agencies and the driving public.

In addition to the fatalities, 1959 traffic accidents caused approximately 1,400,000 disabling injuries. These are injuries causing disability beyond the

---

H. Gene Miller is director of the National Safety Council's research and statistics department.

RATE DOWN

The rate reached an all-time low of 5.4

DEATHS UP

Toll was 37,800, up 2 per cent from '58

POPULATION UP

Population rose 1.7 per cent over '58

day of the accident, and do not include minor injuries which undoubtedly total millions more.

The value of property destroyed and damaged in 1959 traffic accidents was estimated by the Council at 2 billion dollars. All costs—including wage loss, medical expense, overhead cost of insurance, and motor vehicle property damage—were $5,900,000,000.

Deaths by Type of Accident

Preliminary figures indicate that the sharpest increase in deaths in 1959 occurred in multi-vehicle collision accidents and non-collision accidents (running off roadway, overturning, etc.). The first type accounted for 700 more deaths and the second type about 200. Bicycle deaths showed a slight increase of 30.

Increases, however, did not occur in all accident types. Pedestrian deaths and deaths in fixed object and street car accidents were unchanged, while deaths in railroad accidents and collisions with animals decreased.

Type of Motor Vehicle Accidents

Type	1959	1958	% Change
Multi-vehicle	13,300	12,600	+6%
Non-collision	13,300	13,100	+2%
Pedestrian	7,700	7,700	0
Fixed object	1,700	1,700	0
Railroad	1,200	1,316	—9%
Bicycle	510	480	+6%
Animal	80	90	—11%
Street Car	10	9	0
Total	37,800	37,000	+2%

Deaths by Age Groups

Deaths remained unchanged in two age groups, 0-4 and 25-44, according to preliminary reports, while the 65-and-over group showed a 100 decrease. The 5-14 age group showed a 100 increase, while the 15-24 and 45-64 age groups showed increases of 400 each.

Age Group	1959	1958	% Change
0- 4	1,800	1,800	0
5-14	2,800	2,700	+4%
15-24	8,800	8,400	+5%
25-44	10,400	10,400	0
45-64	8,300	7,900	+5%
65 and over	5,700	5,800	—2%
Total	37,800	37,000	+2%

Deaths by Urban and Rural Areas

A 2 per cent increase in rural deaths accounted for 500 of the 800 death increase in 1959 over 1958. The remaining 300 increase, 3 per cent, happened in urban areas.

Deaths by States and Cities

Among 47 reporting states for the month of December, 26 showed increases, 20 decreases and one no change. For the entire year, 17 states had decreases and these were:

Maine	—33%
Idaho	—18%
Louisiana	—11%

Minnesota	— 7%
South Dakota	— 7%
Illinois	— 6%
Kentucky	— 6%
Massachusetts	— 5%
Washington	— 4%
Oklahoma	— 3%
Florida	— 2%
Virginia	— 1%
Alabama	— 1%
Connecticut	— 1%
Nebraska	— 1%
Delaware	— 1%
Wisconsin	— *%

*Less than .5%.

Of the 721 reporting cities in December, 127 had decreases in deaths, 443 reported no change, and 151 showed increases. For 12 months, 273 cities had decreases, 147 no change, and 301 increases.

The following cities of more than 200,000 population had fewer deaths for the 12 month period:

City	Decrease in Number	Decrease in Per Cent
Rochester, N. Y.	12	—46%
Jacksonville, Fla.	12	—32%
Long Beach, Calif.	10	—26%
Seattle, Wash.	18	—25%
Norfolk, Va.	5	—25%
Richmond, Va.	7	—23%
Wichita, Kan.	3	—23%
Buffalo, N. Y.	12	—20%
Pittsburgh, Pa.	13	—19%
Fort Worth, Tex.	7	—16%
Columbus, Ohio	6	—13%
San Diego, Calif.	10	—11%
San Antonio, Tex.	6	—11%
Boston, Mass.	6	—10%
Cincinnati, Ohio	6	—10%
Toledo, Ohio	2	—10%
St. Paul, Minn.	3	— 9%
Syracuse, N. Y.	1	— 8%
Los Angeles, Calif.	20	— 5%
New Orleans, La.	4	— 5%
Akron, Ohio	2	— 5%
Baltimore, Md.	4	— 4%
Minneapolis, Minn.	2	— 4%
Chicago, Ill.	8	— 3%
Atlanta, Ga.	2	— 3%
Cleveland, Ohio	2	— 2%
Washington, D. C.	1	— 2%
Dallas, Tex.	1	— 1%

In December, 484 of the cities had perfect records. Of these, the three largest were: Atlanta, Ga. (491,900), Providence, R. I. (248,700), and Yonkers, N. Y. (183,200).

For the entire year, 140 of the cities had perfect records, and of these the three largest were: Evanston, Ill. (76,200), Parma, Ohio (73,400) and Kettering, Ohio (48,500).

The three leading cities for the entire year in each popu-

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REGISTRATION UP

Registration topped '58 by 3.1 per cent

COSTS UP

Property damage estimate—$2 billion

TRAVEL UP

There was a travel rise of 5 per cent

THE NATIONAL ACCIDENT FATALITY TOLL

	1959	1958	Change
ALL ACCIDENTS	91,500	90,500	+1%
Motor-vehicle	37,800	37,000	+2%
Public non-motor-vehicle	16,500	16,500	0%
Home	26,500	26,500	0%
Work	13,800	13,300	+4%

Note: The motor-vehicle totals include some deaths also included in work and home. This duplication amounted to about 3,100 in 1959 and 2,800 in 1958. All figures are National Safety Council estimates.

All Accidents

Killed—91,500, 1 per cent up from 1958.

Injured—9,300,000.

Cost—$12,600,000,000. Includes wage loss, medical expense, overhead cost of insurance for all accidents, interrupted production schedules, time lost by workers other than the injured, etc., due to work accidents and property damage in traffic accidents and fires.

Deaths of children under 5 years numbered approximately 6 per cent more than in 1958. Among children 5-14 years old the death total was up 4 per cent. Changes in adult groups were: 15-24 years, up 3 per cent; 25-44 years, down 2 per cent; 45-64 years, up 4 per cent; 65 years and older, down 3 per cent.

Fatal falls numbered the same as in 1958—18,300; burns went up 1 per cent (in addition to a classification change) to 7,400. Drownings were down 1 per cent at 6,500. Fatal firearms accidents went up 1 per cent to 2,200.

The 1959 death rate per 100,000 population was 51.9.

Work Accidents

Killed—13,800. This was 500 more than the 1958 total.

Injured—1,950,000, 150,000 up from 1958.

Cost—$4,100,000,000. Includes cost of interrupted production schedules, time lost by workers other than the injured, etc., as well as wage loss, medical expense and the overhead costs of insurance.

Total all-industry employment was about 3 per cent more than in 1958.

Railroad employee fatalities totalled 106 in the first eight months of 1959 down 9 from 1958. The eight-month injury total was 9,194 up 10 per cent from 1958.

There apparently was an increase in the all-industry disabling injury rate.

Worker Accidents

Killed—43,600, up from 42,500 in 1958. On job, 13,800; off job, 29,800.

Injured—4,300,000, up 5 per cent from 1958.

Time lost, including indirect, amounted to 285,000,000 man-days, equivalent to the shut-down of plants with more than 1,000,000 workers.

Public Accidents

(Not Motor Vehicle)

Killed—16,500—no change from 1958.

Injured—2,050,000.

Cost—$800,000,000.

Decreases occurred in the 15-24 and 25-44 year age groups; increases in the 45-64 and 65 and over age groups; no change in the 0-4 and 5-14 age groups.

There were sizeable decreases in railroad, water transport, and firearms deaths in 1959. Increases were recorded for air transport and other specified fatalities.

Railroad Accidents

Eight-month death total—1,346 compared with 1,437 in 1958. Injuries numbered 13,127 compared with 12,436 in 1958.

Grade crossing deaths decreased 7 per cent to 728 while injuries totalled 1,961, up 5 per cent.

Passenger deaths numbered 8, compared with 9 for the same months of 1958.

Trespasser deaths numbered 445, a decrease of 8 per cent from 1958.

Airplane Accidents

There were eight fatal accidents during 1959 in the domestic passenger-carrying operations of scheduled air carriers, in which 198 passengers and 28 crew members were killed. The passenger death rate per 100,000,000 passenger-miles, based on preliminary information, was 0.65.

Home Accidents

Killed—26,500—no change from 1958.

Injured—4,000,000.

Cost—$900,000,000.

A decrease in deaths in the 65 and over age group offset increases in the other age groups.

Decreases were recorded in deaths from gas poisonings and other specified causes. There were increases in deaths from solid and liquid poisonings, burns and firearms. Deaths from falls and mechanical suffocation did not change.

Fire Losses

The value of property destroyed by fire in 1959 was $1,047,000,000, or 1 per cent less than in 1958.

COMING EVENTS

March 6-8, Jacksonville, Fla.

Southern Safety Conference and Exposition (Robert Meyer and George Washington Hotels). Contact W. L. Groth, executive director, P. O. Box 8927, Richmond 25, Va.

March 9-10, Philadelphia, Pa.

Twenty-sixth Annual Regional Safety and Fire Conference and Exhibit (Bellevue-Stratford Hotel). Contact Harry H. Verdier, executive director, Safety Council, Chamber of Commerce of Greater Philadelphia, 121 S. Broad St., Philadelphia 7, Pa.

March 15-16, Fort Wayne, Ind.

1960 Northeastern Indiana Safety Conference and Exhibit. Contact Ivan A. Martin, manager, Safety Council, Chamber of Commerce, Fort Wayne, Ind.

March 21-22, Boston, Mass.

Thirty-ninth annual Massachusetts Safety Conference and Exhibit (Hotel Statler Hilton). Contact Bert Harmon, manager, Massachusetts Safety Council, 54 Devonshire St., Boston 9, Mass.

March 23-25, Corvallis, Ore.

Northwest Highway Engineering Conference (Oregon State College). Contact Martin P. Coopey, Professor of Highway Engineering, Apperson Hall, Oregon State College, Corvallis, Ore.

March 27-30, Dallas, Tex.

Annual Texas Safety Conference (Adolphus Hotel). Contact J. O. Musick, general manager, Texas Safety Association, Inc., 830 Littlefield Bldg., Austin, Tex.

March 28-April 1, New York City

Thirtieth Annual Safety Convention and Exposition of Greater New York Safety Council. Contact Paul F. Stricker, Greater New York Safety Council, Lincoln Bldg., 60 E. 42nd St., New York 17, N. Y.

March 29-30, Oakland, Calif.

Congress of the Eastbay Safety Council (Hotel Claremont). Contact Clinton W. Dreyer, Eastbay Chapter, National Safety Council, 1322 Webster St., Oakland 12, Calif.

April 5-7, Pittsburgh, Pa.

Thirty-fifth Annual Western Pennsylvania Safety Engineering Conference and Exhibit (Pittsburgh Hilton Hotel). Contact Harry H. Brainerd, executive manager, Western Pennsylvania Safety Council, 305 First Federal Bldg., 600 Grant St., Pittsburgh 19, Pa.

April 11-13, Los Angeles, Calif.

Seventh Annual Western Safety Congress and Exhibits (Ambassador Hotel). Contact Joseph M. Kaplan, manager, Greater Los Angeles Chapter, NSC, 3388 W. 8th St., Los Angeles 5, Calif.

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Experts tell how to

MAKE LICENSE PLATES LEGIBLE

License plates on 70 million American motor vehicles will be bigger, brighter, and easier to read if states apply research findings reported recently to the Highway Research Board by three engineers from the University of Illinois.

They told about a two-year study on license legibility sponsored at the university by Charles F. Carpentier, Illinois Secretary of State. Recommendations for Illinois plates have been reported to him.

General conclusions applying nationwide were discussed by Prof. John E. Baerwald under whose supervision C. Gordon Herrington and Del Karmeier carried on the project.

Both were graduate students in the U. of I. College of Engineering. Herrington now is highway engineer with the U. S. Bureau of Public Roads at Gatlinburg, Tenn. and Karmeier is assistant traffic engineer with the St. Louis County Division of Traffic, Clayton, Mo.

They recommended the national size of license plates, 12 by 6 inches, be lengthened to 14 by 6.

For quick, accurate identification under normal daylight conditions at 125 feet or farther they recommended no more than six identification characters on the plates.

For states with fewer than 1,000,000 vehicles they said the easiest read system is straight use of numbers. For larger states they found the best system two letters and four numbers, which provides for 6,000,000 vehicles. All letters should be together at beginning or end of the series, they said.

Bigger characters for state names or abbreviations and for year numbers were recommended to make this information legible at least 65 feet away.

Recommendations were in line with finding that licenses have two functions: to identify the vehicle and to show that the owner has complied with registration laws.

Under these findings slogans and emblems would go off the plates. The engineers reported, "The advertising and publicizing of the state by means of slogans or symbols is not a function of license plates."

Two plates—one front and one rear—were found necessary to best accomplish the purpose of licenses.

Rounded open-style numbers and letters were recommended for best legibility, with letters slightly larger than the numbers, and with selection of high-contrast colors for the plates.

Reflectorization of license plates was discussed by Herrington, who said this increases night legibility by 28 per cent.

"There appears no appreciable difference in legibility of various types of materials used," he said. "However, considerations other than legibility, have an important bearing on choice of reflectorizing material." Factors he listed are visibility, durability, ease of cleaning, all-weather performance, manufacturing requirements, and cost.

College Contest

College journalists will compete for cash prizes totaling $2,100 in the twelfth annual college newspaper contest on safe driving sponsored by Lumbermens Mutual Casualty Co.

Purpose of the contest is to encourage college newspapers to promote safe driving among students through safety campaigns, cartoons, editorials, feature stories and photographs.

Any college newspaper or student journalist in the 50 states or in Canada is eligible to compete for the 10 prizes in the contest.

A first prize of $500, second prize of $250 and third prize of $100 will be awarded in both daily and non-daily publication classifications for the outstanding safety campaigns which appeared in college newspapers between Nov. 9 and Dec. 24, 1959.

One hundred dollar awards will be given for the best cartoon, editorial, feature story and photograph published during the same period.

THE CHALLENGE OF

OFF-THE-JOB SAFETY

by Norman Damon

The off-the-job program pays dividends in dollars and prestige, but some managements still aren't convinced of its effectiveness.

WHAT are the dimensions of the off-the-job accident problem? The National Health Survey for the fiscal year ending June 30, 1958*, estimates 500 million man days were lost from work due to sickness and a resulting annual wage loss of six billion dollars.

In addition, 106 million man days were reported as lost from 47 million accidental injuries of all types. Almost two-thirds of this lost time, 66 million man days in all, resulted from off-the-job injuries. This is equivalent to one working day for every employed person in the country.

Injuries from traffic accidents resulted in a time loss of about 32 million man days, or the equivalent of a half day per worker per year.

It is revealing to note the figures on the major groups of accidental injuries requiring hospitalization. Of home injuries, approximately 2 per cent required hospitalization, of injuries at work, 2 per cent, injuries from other causes excluding traffic, 2 per cent, while motor vehicle injuries requiring hospitalization amounted to a striking 19 per cent.

Traffic accidents represent a large portion of the total problem. The National Safety Council reported a total of 37,000 motor vehicle fatalities in 1958*. These represented 40 per cent of all accidental deaths. Included in the traffic total are 2,600 worker deaths on the job and 17,000 worker deaths off the job. In other words, gainfully employed persons accounted for just over half of our traffic victims last year. Workers also accounted for about 700,000 disabling injuries from traffic accidents.

The Council's figures and those of the National Health Survey are at variance due to differences in the degree of severity of the injuries counted. For example, the Health Survey reports 989,000 workers injured in motor vehicle accidents.

What About Costs?

So much for the scope of the problem in terms of the number of persons and the number of man days of time involved. But what about costs? Where we are dealing with human life and limb many of the costs are necessarily immeasurable, or must be measured in arbitrarily assigned values.

I already have mentioned the Department of Health, Education and Welfare figures on annual wage losses due to illness. Management also can measure with some degree of accuracy other direct losses or increased costs that stem from accidents.

On this point, there is a good summary of off-the-job injury cost elements in a publication of the Du Pont Co. Here is a brief quote:

"Off-the-job injuries are a significant part of our national economy. The cost of manufacturing goods is increased when workers get hurt, whether on or off the job. Some of the items that can affect operating costs when injuries occur are (1) need for relief personnel and training of such personnel, (2) product spoilage or damaged equipment that may accompany the work of newly trained employes, (3) additional work loads placed on supervision, (4) injured employes not able to do their full share of work upon return to work, (5) increase in payments for accident and health insurance, hospital and surgical insurance and group life insurance and (6) additional cost for disability wages."

One large corporation with 58,000 employes, reported that for the two years of 1956 and 1957 it had paid out nearly $1 million to doctors, hospitals, nurses and so forth as a result of off-the-job accidental injuries. These cost figures do not include health and accident premium payments, loss of services of experienced personnel during periods of absence or convalescence, permanent physical restrictions resulting from serious injuries, administrative costs to process claims and reports, uninsured losses to employes, plus many other indirect and undesirable by-products of off-the-job accidents.

Certainly it is apparent that the off-the-job accident problem, both in terms of persons and dollar costs is a major one. But it is, by no means, an unsolvable one. It can be attacked via two channels.

Individual companies can make a real contribution in the over-all effort by beginning with their own employes.

Norman Damon is vice president of the Automotive Safety Foundation.

*Latest figures available at the time of writing.

They have sound economic as well as humanitarian motivation for doing this. Consider this. According to the National Safety Council, and this information is based on only limited reports, off-the-job injuries are happening to workers about five times as frequently as on-the-job injuries. In individual companies, the ratio is considerably higher.

Now let's look at what a few companies already are doing in the off-the-job field.

The DuPont Co. initiated an across-the-board off-the-job accident prevention program in 1953. One of the striking results of this program was that it improved that company's experience with on-the-job accidents as well as with off duty accidents. In fact there was a 50 per cent reduction in the injury frequency rate after initiation of the new program. The off-duty injury rate has decreased by 25 per cent, and that is a healthy beginning.

In Traffic Field

Another interesting fact about the Du Pont experience is that the new program apparently was effective in the traffic field. In terms of motor vehicle fatalities the company rate has been improving steadily. In 1953 its rate was about the same as the national average. By 1957 its rate was 40 per cent under the national average. This is an important gain.

The American Telephone and Telegraph Co. has done an excellent job in developing a reporting procedure measuring off-the-job accident experience. The value of this procedure is well stated in the foreword to the company's report form:

"A primary requirement of any accident prevention program is a good fact-gathering routine. This will keep us informed of the magnitude of the problem and progress being made. We will then have an indication of where and how to focus our attention to bring about improvement. That is the purpose of this practice."

It seems to me that the methodology developed by the Bell System could be adapted by many companies for use in their own particular operation with excellent results.

In its approach to the off-the-job problem the Bell System, as are an increasing number of large corporations, has in several instances gone beyond its own employes—recognizing the community as well as the company aspects. For example, Pacific Telephone, a west coast operating subsidiary, has been carrying on a community driver training project as a public service. This is how the program works. The company provides the instructors and the training facilities. Local industries are invited to provide men to be trained. When these trainees have reached a high enough level of instruction they are expected to return to their own industry and first train all company drivers. Later these same instructors are expected to form a corps that would, on a voluntary basis, offer driving instruction to the people of the community generally.

Another Bell subsidiary, Pennsylvania Telephone, undertook to develop increased safety awareness on the part of the children of the state. Accordingly, the company developed a safety game that was made available to children without charge upon request. It has proved exceedingly popular.

The public relations value to the company from activities such as these scarcely needs to be stressed.

The R. J. Reynolds Tobacco Co. got important public relations benefits from its work in behalf of high school driver education in North Carolina. This company's effort is credited with having been instrumental in obtaining legislative approval of a driver education program for the state. Additionally, this company has been carrying on an off-the-job program directed at its own employes.

The Radio Corporation of America has reported encouraging initial results from an off-the-job accident prevention program begun with its employes in 1955. As a result of this effort employes have continued a voluntary vehicle safety check in cooperation with local police authorities.

These are just a few examples. They do illustrate that off-the-job accidents can be reduced when management takes an interest in tackling the job. These illustrations can point the way for others.

How to Interest Top Management

So now we come to the key question. How do we go about interesting management generally in initiating off-the-job programs for company employes and in participating on a company basis in community programs?

That question is easier to ask than it is to answer. To do this job is going to take some selling, I am sure.

We will be making a big forward stride if we can only get management to take a hard analytical look at the problem, as it affects the operations of the particular company. In other words, what's needed is to induce management to view this situation on the same objective basis that it considers other factors that affect operating efficiency.

Pretty generally, I believe, management recognizes its obligation to its stockholders and owners to operate at an optimum level of efficiency. In a competitive economy, such as ours, this

matter of efficient operation cannot be ignored successfully or for very long. So it seems to me that management has to be approached in terms that it understands and on a basis that it accepts as a proper one. Certainly cost reduction is something that management understands and accepts as both proper and desirable.

More and more companies are priding themselves on being known as good places in which to work and as good citizens of the communities in which they do business. So it seems to me that management also will be responsive when it understands the public relations values that can stem from work in the field of off-the-job accident prevention.

In our mission to step up activity in the off-the-job field, where can we turn for help? I should like briefly to review some of the many resources available. First let's look at the national agencies:

● **National Safety Council**—The National Safety Council spearheads the total accident prevention program in this country. Here is the work of the Off-The-Job Committee of the Council's Industrial Conference. It has revised a quarterly reporting form for off-the-job injuries, with prompt and encouraging response from companies. This should be widely adopted.

Under the leadership of the Industrial Conference, the Council has developed a smooth functioning internal team. Realistically, of course, it has only scratched the surface of results it can achieve. This includes the work of the Home Conference and its home safety questionnaire issued through state and local safety councils. The Labor Conference of the National Safety Council notes a most encouraging growth of interest among labor organizations. For instance, last year the Labor Conference utilized the celebration of Labor Day in the interest of off-the-job accident prevention. This and related activities are backed up to an increasing extent by a growing number of labor publications.

In addition, the Traffic and Motor Transportation Conferences and the Conference of State and Local Organizations should be mobilized on this front.

The really important job for the state and local safety councils, however, is with non-manufacturing industries.

Stories on some of the programs mentioned in this article will be published in future issues of TRAFFIC SAFETY.

Manufacturing industries, largely due, I think, to the interest of top management, represent a relatively small portion of the problem. Manufacturing industries for instance, employ roughly a third of the employes, but account for less than one-seventh of the deaths. In other words, the non-manufacturing industries employing some two-thirds of the people, account for roughly 85 per cent of the deaths. That spells out, to me, the real measure of the challenge facing state and local support groups.

● **Federal Agencies**—We can well look for major help from federal agencies—the President's Conference on Occupational Health in the Department of Labor, and the Accident Prevention Program in the U. S. Public Health Service. On the traffic front, we look to the U. S. Bureau of Public Roads, the Interstate Commerce Commission and others.

● **Employer Groups**—We should certainly encourage increased interest and participation by employer groups such as the Chamber of Commerce of the United States and the National Association of Manufacturers, and their affiliated state and local counterparts.

● **Trade Associations**—There are, of course, a great many trade and professional associations that might well be mobilized in this crusade.

The American Society of Safety Engineers, which I believe has had a committee on the subject under the chairmanship of Prof. Amos Neyhart, of Pennsylvania State University, has made a big step forward. That committee developed an excellent program.

Here are some figures as I have them from a study by the Society in 1951 and just now being brought up to date, bearing directly on this question of the interest of top management. This, of course, relates to the on-the-job program, but I am sure the same story would hold true for their work on an off-the-job program.

"The Society of Safety Engineers found that the median number of disabling on-the-job injuries per million man-hours of exposure among the companies surveyed was 7.5.

"But they also found that where a company safety director reported directly to his president, the company's injury rate was not 7.5, but 4.8.

"Where the director reported to a vice president, the rate was 5.1; to the

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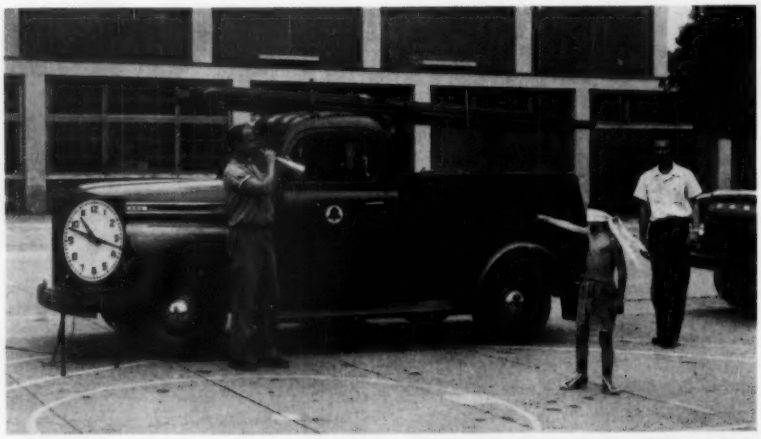


Pennsylvania Telephone's off-the-job program includes community children. Here youngster learns not to trust ears to identify direction of traffic sounds.

Paul M. Bryan Joins N.S.C.

Paul M. Bryan has joined the National Safety Council field service staff as district director for Kentucky, Tennessee and Arkansas. He succeeds Evett N. Allen, who resigned to become assistant to the city manager of Norfolk, Va. Allen had been with the Council two years.

Bryan comes to the Council from the American Bar Association, where he had been field representative for the Traffic Court Program for two years. In this position he assisted in the coordination, promotion and supervision of the six yearly regional and numerous state traffic court conferences of the ABA.

Prior to his affiliation with the ABA, Bryan was judge of the Court of General Sessions of Memphis. He has also served in the Tennessee legislature and has held the positions of Assistant City Tax Attorney of Memphis, Deputy Divorce Proctor of Memphis and Special Prosecutor for the O.P.S.

He will reside at 1951 Snowden Ave., Memphis.

Engineering Seminar

For the seventh successive year, the Midwest Section of the Institute of Traffic Engineers and the Traffic Institute of Northwestern University are co-sponsoring a three-week seminar in traffic engineering. The 1960 seminar will be held from March 7 to March 25.

One of the main purposes of this seminar is to broaden the professional knowledge of less-experienced engineers and those who may have become highly specialized in a large department. Attendance is limited to persons with considerable educational backgrounds or experience so that they may derive the greatest benefit from the instruction and make the best use of it in their jobs.

Instruction will be given by Northwestern University staff, members of the Institute of Traffic Engineers and leaders in the traffic engineering field. The seminar will be held at the Traffic Institute of Northwestern University, Evanston, Ill.

AMERICAN BICYCLE MONTH TO BE HELD IN MAY

American Bicycle Month will be observed nationally in May.

Sponsored by the American bicycle industry, bike month includes a series of public services aimed at the nation's cyclists as part of a continuing program to make bike riding a safe, pleasant year-round activity.

To alert riders to the need for proper maintenance practices, the industry has developed a cost-free community-level program calling for the inspection of all bikes. Riders merely take their two-wheelers to participating repair shops, where skilled bike mechanics will examine the riding assembly, pedals and brakes, steering assembly, tires and wheels, and lighting and signalling equipment. A bike month bike emblem will be issued to each bike owner upon completion of the inspection.

At the same time, bike sellers will offer the 12 rules of safe riding, and a series of riding "tips," at no cost, to each bike owner requesting them during bike month.

These services, the Bicycle Institute of America has pointed out, are being made available as an industry service to make bike riding even safer and more pleasant than it already is.

"Every bike should be inspected for possible mechanical defects due to wear, much as a car," Executive Secretary John Auerbach stated. "Too often, riders fail to correct minor faults due to intensive bike use. These often result in mechanical difficulties which might have been avoided had a proper maintenance routine been established."

Among those planning to take advantage of the industry's program are school leaders, police chiefs, civic and community groups, fraternal groups and youth organizations.

Last year six states and five cities issued proclamations designating May as American Bike Month.

In many areas, interested organizations arranged for group inspections. Cooperating organizations made arrangements with local bike repair specialists for group inspections of two-wheelers at centrally-located areas, such as school yards and shopping center parking areas.

Metropolitan Research Award

The Metropolitan Life Insurance Co. and the National Safety Council have announced the establishment of the Metropolitan Award to recognize investigators studying the causes of accidents. The purpose of the award, which will be administered by the Council under a grant from Metropolitan Life, is to encourage research workers in the various sciences to include the problem of accident causation in their studies.

The award, which includes one thousand dollars and an appropriate testimonial, will be given for the research project in any field of accident prevention judged to be the most significant contribution toward the reduction of accidental injuries and deaths.

Because the field of accident prevention cuts across all scientific areas and is so broad in scope, research may come from any of the disciplines—biological, physical or social. It can also include interdisciplinary undertakings.

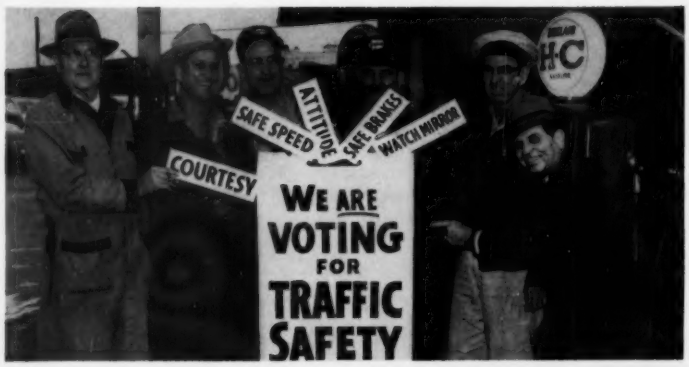
To recognize the investigators now studying the causes of accidents and to encourage further research, the 1960 award will be made for research completed within the three-year period of 1957 to 1959.

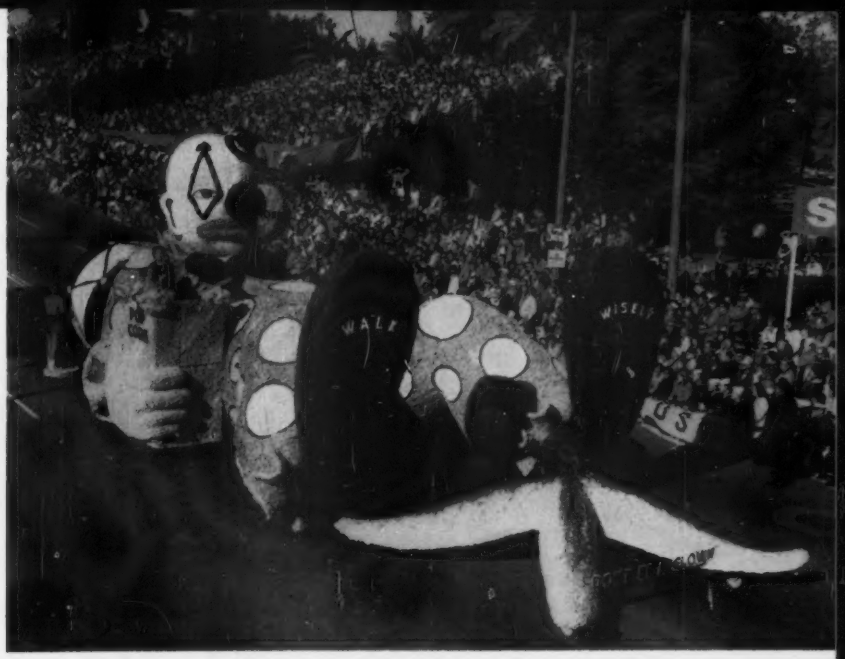
Rules and information may be obtained by writing John J. Flaherty, director, Research Division, National Safety Council. Projects must be submitted before April 30, 1960.

NEWS and VIEWS

The tall, characteristically Italian cedars and the rolling Italian landscape contrast with the concrete pillars and roadway of the *Autostrada del Sole*. "The Highway of the Sun," to be completed this year, is Italy's most modern highway. A limited access expressway, the road runs from Milan to Naples—a distance of 450 miles, including six miles of tunnels. The total cost, estimated at over $400 million, is being financed 51 per cent by the Italian government and 49 per cent by private investors.

W. F. Leonard (far right), vice president for traffic safety of the Texas Safety Association, ended 1959 with a series of rapid-fire eight-minute safety talks at Dallas filling stations. The Eastbay Chapter National Safety Council (below) was honored on its 37th anniversary by the Oakland Kiwanis Club—the same club which helped found it 37 years ago. Over the years there have been only two safety council managers, Florence I. Anderson (center) and Clinton W. Dreyer (left). They are shown with a group of past presidents of the Chapter.





"Don't be a clown—walk wisely" was the message of the National Safety Council's giant float in the Pasadena Tournament of Roses parade. The float was sponsored by the Farmers Insurance Group American Legion Post 707 as a public service. Actress Ann Blyth and her son, Timmy, along with Richard and William Pittenger, rode in the "pop corn box."

The pictures above are part of a public education program conducted by the Greater New York Safety Council to teach dog owners that rough-housing pets are just as dangerous in a car as uncontrolled children. The dog climbing all over his master is a menace. The same dog, properly trained, is shown sitting obediently on the back seat where he belongs. Any dog can be so trained. Patient firmness will do for this or any other trick.

Dr. J. Will Tankard explains the model of a public driving course built as a joint project by the Kiwanis Clubs of Hampton and Newport News, Va. Including over two miles of well marked roads, the training range is located on a 60 acre tract. High school students use the course during the week, and the general public is admitted on weekends.

CAN LAWS CURB KARTS?

by Jean Carper

Two years ago kids in California attached lawnmower engines to homemade racers, dubbed them "karts" and thus launched a dangerous new craze that captured thousands of youngsters and parents. The karts are now seen whizzing down sidewalks, circling parking lots and speeding along on specially built race tracks.

Inevitably some of these karts, guided by immature hands, got out of control. At least four children have been killed in the karts and others seriously injured. The situation was fully reported in "Little Cars—Big Dangers" November 1959, TRAFFIC SAFETY.

THE kart craze, grown to ominous proportions, has become a national headache for everyone concerned with safety. The problem is: How can we keep karts off public streets? What about private race tracks? Can we count on existing laws? Or must we depend on parent education?

No matter what the approach, it's going to be difficult.

Little car manufacturers and dealers, happy with a business bonanza, are determined to prolong the kart craze until it becomes as permanent as the family car. The newly formed American Kart Manufacturers Association confidently predicts that kart racing will continue to boom and become one of the country's major community sports. Almost overnight, 300 kart firms have sprung up, supplying 1,400 dealers, according to *American Bicyclist* and *Motorcyclist* magazine.

Rubber companies have experienced a booming demand for small pneumatic tires for karts. A major tire and rubber company has even launched a promotion of kart racing for kids. The firm awarded a $1,000 scholarship to an eight-year-old Ann Arbor, Mich., boy for winning the first annual All American track rabbit championship race at Sebring, Ohio. He averaged 30 m.p.h.

Even more vehement supporters of karts seem to be parents. Following publication of "Little Cars—Big Danger," TRAFFIC SAFETY received much applause, but also scathing condemnation. The latter came from parents, mostly members of community kart clubs, organized with officers and rules to encourage child racing.

Parents indignantly insisted that both the cars and racing are safe. What's more, they asserted, such racing builds character, cements father-son relationships and educates good drivers. They expressed disbelief that anyone could find fault with such an obviously wholesome sport.

Several parents were outraged that the article lumped $500 quarter midget racers with $100 go-karts. These cars are entirely different, they said. A mother from Tennessee made the distinction that quarter midgets have a roll bar, safety belts and a strongly built body to protect the child. Go-karts (skeleton cars) are an entirely different story. "I could not agree more wholeheartedly that go-karts are very dangerous," she wrote. "Most race without safety belts and I have never seen one with a roll bar."

As other parents observed, the three deaths reported in the article happened when the children were driving go-karts, not quarter midgets.

Admittedly there is a legitimate distinction between these two cars, but both can produce the same result—death. Both will condition children to speed and competition, which may later be transferred to highways with tragic results.

Protests From Press

The opposition to karts is not limited to safety professionals.

Don O'Reilly, in his syndicated "Inside Auto Racing" column, condemned junior size auto racing. He wrote: "Keep (youngsters) out of cars until they are old enough to know what they are doing. It has often been said that while auto racing has admitted risks, no one ever forced a man to drive. They know the risks they take and do it voluntarily. The same cannot be said with the same validity about a 10-year-old boy."

The Indianapolis News, after two deaths from go-karts in Indiana, editorialized against letting any youngster below legal driving age operate a car anywhere—on public ways, private property or on "what some citizens call 'properly supervised' tracks in competitive meets." Two Indiana legislators proposed a law to ban the cars in Indiana. Although this bill was dropped, Indianapolis is now seriously considering proposal of an ordinance to prohibit children's auto racing.

Other states have used existing laws

Jean Carper is editor of NSC's *Home Safety Review.*

to combat karts. Some states, however, feel special legislation may be necessary.

In a survey by the Traffic Division of NSC, all 42 responding states felt present laws enabled them to keep miniature motor cars off public ways. Every state classified the cars as motor vehicles, which means, that to be operated on public roadways the cars must meet safety requirements, be licensed and operated by a licensed driver. Since the karts and most kart drivers, can't possibly qualify, they are automatically ruled off streets and highways.

Several states have cracked down on the use of the karts on roadways. Delaware, Mississippi, New Jersey, New York and West Virginia warned parents not to let children use karts in the street. Tennessee says a child caught driving a car in public will be taken before the juvenile judge. Washington announced that officers can arrest parents of child drivers for allowing an unlicensed operator to drive a motor vehicle on public ways. Wyoming pointed out that any dealer selling a miniature motor car for use on public streets is guilty of an unlawful act.

The need for these warnings was tragically highlighted by the first kart fatality in city traffic. A 10-year-old boy in Dalton, Ga., smashed his two horsepower vehicle into the side of an auto at an intersection.

Traffic officials agree that kart racing on private property is more difficult to regulate. Some states want to keep hands off private property. Others exercise some control.

A strict race track law in New Jersey prohibits kids' kart racing *even on private property.* The law forbids anyone under 18 years old to participate in a motor vehicle race. It also requires vehicles in racing exhibitions to meet certain safety requirements, unattainable by little cars. This law practically rids New Jersey of the cars.

Connecticut has a race track law similar to that of New Jersey, but it was amended in 1957 to exclude vehicles under three horsepower. Safety people hope, though, to eliminate this exemption. Alarmed by owners who soup up three horsepower motors to go 65 m.p.h, the Connecticut Safety Commission is preparing a statement condemning the cars. According to Governor Ribicoff, who opposes the cars, this statement should halt the growth of kart racing in the state.

Said James M. Reardon, chief of police, Manchester, Conn., "All of us must take a very firm stand against racing in any form, for we cannot truthfully say we need driver education in one breath and then sponsor or sanction any form of racing whatsoever."

In North Carolina, the county of Alamance has an ordinance forbidding motor vehicle racing on Sunday, the day when most races are held. The state also has a law forbidding reckless driving, which endangers lives, on any driveways of public or private institutions or establishments providing parking space. This prevents kids or adults from holding parking lot races.

Arizona officials suggested that a private race track might be declared a public nuisance and hence outlawed. The complaint, however, has to come from a private citizen, not public law officials.

Whether cities and states will eventually pass special legislation against karts is uncertain. Several states report their legislatures plan to consider new laws. At present, the solution to the kart craze seems to be parent education and strict enforcement of existing laws.

Readers Talk Back

Safer Than Bikes

"I was shocked (your) organization would print such a pack of half truths and misinterpretations. . . . Look into statistics at regularly run tracks for both midgets and karts. . . . You will find the death rate is very low if any at all and that compared to 400-500 juvenile bicyclists killed each year, it is a blessing. . . . Maybe we had better stop buying bikes. . . . Rather than condemn (karts) why not tell people how to handle these karts and midgets in the safest manner?"

Barbara J. Mastri, Secretary
San Diego Formula K Racing Association

Strong Words

"(Your article) was indeed a classic in biased writing and outright slander. . . . Thousands of parents who allow their children to drive these little cars would (not) continue to do so year after year if they were being killed and injured at the alarming rate your magazine would have its readers believe. . . . In many states, quarter midget clubs are sponsored by thinking police departments, impressed by the safety of the sport and its obvious value . . . in driver education.

Ralph LeGendre, President
Silver City (Conn.) Junior Sports Association

Irate Father Speaks Out

"We fathers do not feel we are quite the 'monsters' your article may allow readers to imagine. We love our children, and feel our racing can be made safe with supervision and with proper safety equipment. . . . To condemn us without proper investigation is unfair."

William W. Wilson, President
Lafayette, (Ind.) Kart Club

Mother Has Her Say

"Isn't there a large possibility you have falsely accused a great many good parents while trying to reach a percentage of bad parents? . . . I am a parent of two quarter midget drivers. . . . Safety is the first rule of (our) quarter midget association. . . . Each car must have a firewall, approved safety belt and roll bar. . . . The helmet and goggles must meet safety specifications. . . . I am on hand to take care of first-aid. In two years . . . I've dispensed one band aid to a father and three band aids to children."

Evelyn Meyer
Memphis, Tenn.

OHIO'S "L AND L SPECIAL"

Lawyers and laymen of Buckeye State hold first statewide follow-up to Miami Beach conference. Establish pilot plan for traffic court improvement.

by J. Grant Keys

OHIO's Governor, Michael V. DiSalle, squinted at the TV lights suddenly flooding the stage, peered through to the crowd of 1,200 delegates filling the fairgrounds Youth Center auditorium and concluded his greetings with, ". . . If the sole result of this splendid turnout of leadership and talent be the saving of one human life on our highways, Ohio prospers and mankind gains. Confidently, we wish you every success."

And so the first statewide follow-up to the Miami Beach Lawyer-Layman Conference was underway.

The purpose of the conference, held on December 8, 1959 in Columbus, was to acquaint lawyers and other citizen leaders with the importance of traffic courts in the American System of justice and to mobilize their support for the improvement of courts in their home communities. Sponsored by the Governor's Traffic Safety Committee and the Ohio State Bar Association—with an able assist from many other groups—the conference is expected to provide a pattern for similar meetings in other states. Illinois, Arkansas and Rhode Island are considering holding such meetings in the near future.

Here's how the one-day briefing went.

The morning session explored the need for traffic court improvement and investigated methods of obtaining it. On the program were Harry M. Pontious, chairman of the Governor's Traffic Safety Committee; Mark McElroy, Ohio's attorney general; Allan B. Diefenbach, Ohio State Bar Association president, and John D. Randall, American Bar Association president. Carl V. Weygandt, chief justice of the Ohio State Supreme Court, addressed the conference luncheon.

Three one-hour group discussions took place in the afternoon. Each panel included a moderator, a judge, a prosecutor, an enforcement representative, a news media spokesman, a legislator and a reporter.

From 1 to 2 p.m. delegates and panelists concentrated on (1) Ohio's traffic court system, (2) court administration and (3) correction and penalization. To provide resource personnel, all panels received on-the-spot assistance from pre-assigned members of the Department of Highway Safety, the State Attorney General, the Buckeye State Sheriff's Association and the Ohio Chiefs of Police Association.

Governor Michael V. DiSalle

J. Grant Keys is director of the Ohio Department of Highway Safety and executive secretary of the Governor's Traffic Safety Committee of Ohio.

These question-and answer panels provided information to the court administrators as well the laymen in the audience. Among those attending these sessions were representatives from high school driver education classes and the 11 regional state youth traffic safety conferences, plus two entire classes in government from nearby Ohio State University.

The conference returned to general session to hear the panel briefs. Then the delegates sat back while an action panel of performance award winners in various areas of court improvement tackled the problem of how to improve the picture back home. Two judges, the *Cleveland Plain Dealer* bureau chief, a county traffic safety chairman and the extension safety specialist of the Ohio State University suggested local level approaches to upgrading traffic courts.

The Governor's Traffic Safety Committee then conducted a brief business session, electing officers and establishing a new standing committee on courts to bolster vital public support. By 4 p.m. the delegates had departed. In less than eight hours, Ohio's top traffic safety leadership had executed a hard, sure turn on the road to traffic court improvement.

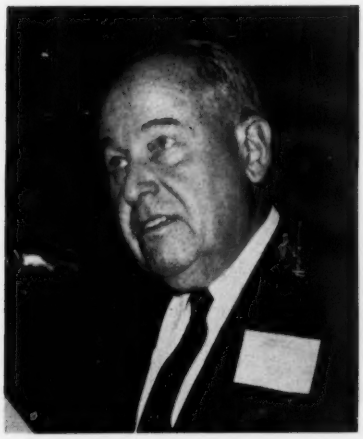
But two months of intensive preparation had paved the way.

The meeting's planners had charted every last detail, including pre-registration of delegates and a conference-eve participants' orientation-press dinner, had screened the make-up of every conference panel, selected the speakers, issued personal invitations, and prepared the publicity. They had anticipated every given factor except one—the tremendously enthusiastic response. They had estimated attendance in excess of 600—just half the final figure of 1,200.

From the start the conference idea had been well received. Invited speakers and panel participants accepted 100 per cent. And some of them went to great lengths to honor their commitments.

When Ohio State Supreme Court Chief Justice Carl V. Weygandt discovered that the conference date coincided with an all-day session of his court, he skipped his own lunch and rest period to deliver personal greetings at the delegates' luncheon. Keynote speaker John D. Randall, American Bar Association president, chartered a special plane to keep his conference engagement when a personal emergency arose.

Media coverage was excellent throughout. Radio, TV, wire services and newspapers all contributed. Typical of this support was an editorial appearing in the Akron *Beacon Journal* a week before the conference which stated "every Ohio judge who handles traffic and every lawyer who prosecutes or defends traffic violators should attend the conference . . . Laymen interested in traffic safety at all levels will find it enlightening."



ABA President John D. Randall

Judge Carl V. Weygandt

Dr. Miller McClintock

Dr. Miller McClintock, dean of the nation's traffic engineers and a vice-president of the National Safety Council, 1927-30, died January 10 in Scarsdale, N. Y. He was 65 years old.

Dr. McClintock was born in Cedar Rapids, Neb., June 13, 1894. He received his A.B. degree from Stanford in 1918, Ph.D. from Harvard in 1924 and D.Sc. from Tufts in 1938.

After serving as instructor in English at Stanford for three years he became assistant professor of municipal government at the University of California in 1924. In this position he started some of the earliest studies in traffic and police administration and in 1925 founded the Bureau of Street Traffic Research at Harvard which he headed until 1938. He was author of many articles on traffic problems and served as consultant to many cities and states and to the federal government.

Realizing the importance of advertising in educating drivers and pedestrians, he became a director of the Advertising Research Foundation in 1933. In 1942 he left the foundation to become executive director of The Advertising Council, Inc. From 1942 to 1944 he was president of the Mutual Broadcasting System.

James I. Banash, NSC Past President, Dies

James I. Banash, internationally known authority on compressed gases and president of the National Safety Council, 1932-33, died January 10 in Los Angeles where he had lived since his retirement in 1951.

A graduate of Massachusetts Institute of Technology with a degree in electro-chemistry, Mr. Banash served as instructor at the institute for a year. For 12 years he was with Underwriters' Laboratories in Chicago and became head of the casualty department. As consultant to Union Carbide Corp. and the International Acetylene Association he made important contributions to safety in the use of compressed gases. In 1950 he was awarded the Morehead Medal by the IAA.

In addition to serving the National Safety Council as president he was vice-president for finance for two years and for many years was a member of the board of directors.

WOMEN MEET TO STUDY ACCIDENT PREVENTION

Illinois session held to outline problems

ON January 19, delegates from member clubs of the Illinois Federation of Women's Clubs met at the National Safety Council headquarters to participate in a seminar that is to serve as a pilot for other Illinois groups.

The seminar was designed to give district presidents and safety chairmen an overall picture of the safety needs in Illinois and to outline the part women's groups can play in the safety movement. It was co-sponsored by the Women's Department of NSC and the Illinois Division of Traffic Safety.

Mrs. Marvin Craig, safety chairman of the Illinois Federation, presided.

In welcoming the group, Gen. George C. Stewart, executive vice president of the National Safety Council, stated that women are the key to the safety movement and that there is universal recognition of the great contribution which their organizations are making. He cited the part played by the Illinois Federation in preventing passage of the proposed "scooter bill" at the last session of the Illinois legislature as an outstanding example of the legislative influence women's groups can exercise.

Marvin Nichol, director of the Council's Civic Leadership Service, outlined effective planning methods. He suggested the following procedure:

Get the facts on the local situation from local officials and other agencies and from the Annual Inventory of Traffic Safety Activities if the community participates in it. Armed with this knowledge, select a project. Then lay out a plan, making a time schedule and following it. Publicize the project by contacting local media people and keeping them informed. Set definite goals. Include other groups in the project, making a special effort to interest youth groups. Be sure to give recognition to workers—both within and without the organization. Finally, measure performance against pre-selected goals.

Robert Campbell, director of the Illinois Division of Traffic Safety, outlined the official state program in the areas of driver education, pedestrian safety, traffic courts, bicycle safety and drinking and driving. He gave specific suggestions as to how women can help. They can promote driver education, he said, by 1) recommending that more cities of 5,000 population and up enter the NSC Traffic Inventory program, 2) working with PTAs and school boards to encourage high school driver education for all eligible students, and 3) suggesting participation by school districts in the Council's school Safety Honor Roll program.

In the all-important field of pedestrian safety, Campbell said women can do a top job by talking with city officials and local citizen groups to encourage a complete pedestrian protection and safety program in their communities.

He praised the Federation's "Go to Court as a Visitor, Not as a Violator" program. He also suggested that groups extend invitations to local judges to speak at meetings, and that they offer their services to help judges establish driver improvement schools or violator schools when judges have indicated their interest in such projects.

In discussing bicycle safety, Campbell outlined the basics of a good program—licensing, registration, inspection, classroom instruction, written tests and skill tests. He recommended several of the kit type programs that are available, and gave special mention to one developed for the small community by Mrs. John Jacobs of the Jerome Women's Club. He called this one of the finest programs he has seen.

The afternoon session of the seminar was devoted to home safety and public safety.

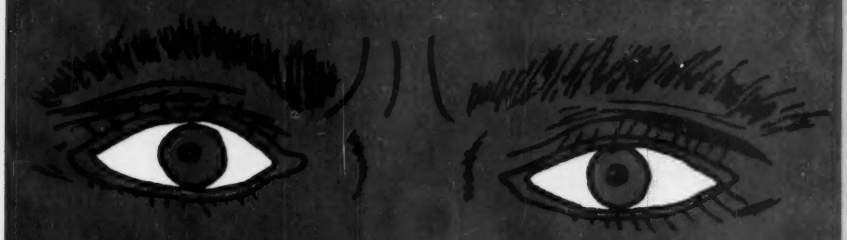
Two similar seminars, following the same pattern, have since been held in Illinois—one at Springfield, the other at Carbondale.

Commenting on the seminars, Alice Catherine Mills, director of NSC's women's department said:

"This was a significant series of meetings and we hope the pattern developed in it will be used in other states and by other organizations."

Marvin Nichol, director of the Council's Civic Leadership Service outlines safety problems before delegates of the Illinois Federation of Women's Clubs at National Safety Council Headquarters in Chicago.

EYES ARE FOR SEEING



"I didn't even see him" is a very common cry after an accident. Here's what needs to be done to end such talk

by David C. Sharman

THE master control mechanism of any automobile is the man behind the wheel.

How does this delicate control mechanism work?

A flash of light enters the eye and paints a little upside down picture of an object on the retina at the back of the eye. The picture is very small—about 1/100 of an inch across.

This picture is flashed to the brain which turns it right side up and immediately enlarges it to actual size.

Thereupon the brain goes into a whirlwind of activity such as occurs nowhere else on earth. It asks (and answers) such questions as: What is this thing? What color, shape, size? What have I seen before that is like it? How fast is it moving? Is it dangerous?

Having instantly reacted to light by way of recognition and judgment, the brain extends its reaction and stimulates its motion-producing attachments. It sends a nerve flash to arms and legs commanding them how and when to move.

The hands move, turning the wheel. The legs move. A foot is transferred from accelerator to brake.

The car responds. It swerves, slows down, moves ahead safely!

The American Optometric Association reports our eyes control 90 per cent of all movements and decisions behind the wheel; the results—when our eyes aren't functioning correctly—are inevitable.

"Driver failure" causes more accidents than traffic, road conditions, deliberate law violations or mechanical problems, and common sense tells us that good vision is an important factor in safety on our streets and highways.

When all is said and done the proximate or immediate cause of a large number of all motor vehicle accidents is *not seeing the collision object.* This may be due to a number of causes, such as:

- Driver's vision below acceptable standards.
- Eye strain due to improper correction, lack of correction, abnormalities, or disease.
- Low and short range visibility due to darkness, fog, rain, snow, blind corners and short sight distance due to weather or other conditions outside and inside the car.
- Distraction to the driver from within or without the car. This may be conversation, children, animals, noises and other influences.
- Lack of mental alertness on the part of the driver due to fatigue, drugs, physical condition or even low mentality.
- Conditions of poor visibility due to frost, snow, or dirt on the windshield, steam on glasses, glare in the driver's eyes, and similar causes relating to the car.

Since accident-free driving depends to a great extent on quick perception and alert responses, the American Optometric Association makes the following recommendations:

1. **Improve the driver's visual performance to the best possible correction.** Every state should adopt the professionally recommended minimum vision standards for drivers licenses. Every individual should be encouraged to seek the maximum vision correction of which professions serving the art and science of vision care are capable. Each time a practitioner prescribes a vision correction he should, by suggestion or illustration, call attention to driving hazards which are related to vision.

David C. Sharman is assistant administrative director of the American Optometric Association.

2. **Teach correct driver seeing habits.** Until the student driver masters the hands-and-feet part of driving the car, and until he develops his judgment of relative speeds and distances, he has "sticky eyes and pinpoint vision." By understanding and practicing the defensive seeing methods developed by the Institute of Driver Behavior and used by experts, the student driver can prevent early seeing errors from taking root as accident-breeding habits. The driver who "sees defensively" views the whole traffic environment—front, rear and sides—not just the rear end of the car ahead.

3. **Remove visual distractions.** The National Vehicle Safety-Check program is sponsored annually by the Inter-Industry Highway Safety Committee and *Look* Magazine in cooperation with the Association of State and Provincial Safety Coordinators. Many communities tie in vision-check lanes to screen driver vision and to note obstacles to vision which may be removed or replaced for safer driving.

Mirror and mirror supports should be kept free of sunglasses, neckties, large dice, baby shoes or other objects that might possibly obstruct vision or distract the attention of the driver. In some states this is a legal requirement. The rear view mirror should at all times be positioned to reflect a view of the highway for at least 200 feet to the rear. A mirror mounted outside the car within easy view of the driver is a great help and is required by law in some states.

Windows should be cleaned at least once a month as a matter of routine. A film builds up on the inside of the windows especially when there is smoking in the car.

Sun visors should be kept in such condition that they can be readily adjustable to all positions to shield the eyes from glare. They can be hazards to driving when misused as storage bins. Junk tumbling down from a precarious perch on the sun visor will distract the driver.

The shelf in front of the rear window should be kept clear in the interest of safety as well as to protect any property which could fall off during a sudden stop or impact.

Dust on the floor coverings is a menace since it can blow into the eyes, especially when air vents or windows are open. Dust irritation and annoyance can also speed up the process of driver fatigue.

Good housekeeping of the motor vehicle is a must for safe driving.

The development of easy, quick reading road and traffic signs would ease another source of visual distraction for the driver who must read them. Many signs are too small, others camouflaged by their background; some are reduced to obscurity at night by the wilderness of neon and other lights in which they are framed.

In Europe drivers rely on the shape and color of signs as much as they do the message that is printed on them. How much easier it would be if all highway signs in our towns and cities were of different colors. Instead of looking for highway 67 we could follow the green signs out of town. If we want highway 66 we could follow the orange signs out of town, and other colors for other routes.

These are only some of the visual distractions which plague drivers. There are others. But common sense, "good car-keeping," and good engineering can mitigate or eliminate almost all of them.

Another Big Plus

And modern science, fortunately, can solve most of the other *vision* problems. All but a few of America's motorists can have vision good enough for safe driving. The methods for improving driver vision are known, available and being applied—but not widely enough. Consequently, optometrists and others believe that driver vision is one of the elements of highway and traffic safety with the greatest undeveloped potential for immediate improvement.

In 1957, a voluntary vision screening survey was launched by the American Optometric Association and its Woman's Auxiliary in cooperation with the Automotive Safety Foundation, the National Home Demonstration Council and other organizations. Its basic purpose was to find what percentage of licensed drivers fall below acceptable standards on the major visual requirements for safe driving.

Portable screening equipment was set up in scores of communities. Drivers were invited to have their vision tested by standard techniques, without charge or obligation. The tests were administered by laymen, but supervised by licensed vision specialists. Almost all non-technical details were handled by women's organizations—members of the National Home Demonstration Council, and the General Federation of Womens Clubs. Both men and women drivers were tested—in about the same proportions as licenses are held by male and female drivers.

At the time of the preliminary report, which covered some 3,000 licensed drivers in 25 states, it was indicated that at least one out of every five drivers, with or without glasses, had vision defects which affected his driving.

An unsuspected benefit of the testing was to make the driver more conscious of his visual capacities. The driver learned that if he lacked adequate depth perception, he could compensate for his shortcoming by being especially cautious in situations where good depth perception is called for. He learned that he should look to the side more frequently if he knew that he did not have the peripheral vision he should have. If glare bothered him or if he was found abnormally handicapped in low illumination, he learned he should cut down his night driving and reduce his speed.

As to the correctability of the vision of those failing the tests, valuable studies were made by Dr. Henry W. Hofstetter, director of the division of optometry at Indiana University. From studies of 332 clinic patients, he found that only 0.3 to 0.6 of 1 per cent of a large cross section cannot be corrected to meet the requirement on acutity (20/40 Snellen in the better eye). His report also showed that 96 per cent of the driving population can be corrected to 20/20 in the better eye.

Tests in the survey dealt with these essential visual "skills":

Acuity—ability to focus and see clearly with each eye separately and both eyes together, particularly at a distance of many feet or yards. This is essential for seeing danger, reading road signs in time, and for general adaptation to the critical driving environment. It is essential but only a small part of the total visual requirement. It is the only "skill" tested in the conventional Snellen Letter-Chart test used by most driver license examiners, and usually the tests are given under such varying conditions of light, cleanliness of test-charts, etc., that even this, the only

usual test, is far from adequate. In the survey, the tests were made under carefully controlled conditions for as much uniformity as possible.

Depth Perception—ability to judge space and distance. For most drivers this depends on good binocular (two-eyed) vision, because space and distance are determined by the brain in relating the image from one eye to the image from the other at the slightly different angle that results from the separation of the two eyes. Depth perception is essential for judging whether a car can be passed safely or whether a driver has time and space to maneuver from one lane to another among fast-moving vehicles on a highway. The screening instruments used in the survey tested both binocularity and space judgment—neither of which is covered adequately in the conventional eye test for driver licensing.

Field of Vision—ability to see to the sides when focused straight ahead. This, of course, is essential to detect cross-road traffic, pedestrians at the side of the road and for ease in watching interior and exterior rear-view mirrors and for an adequate grasp of the visual environment of driving. In most states no attempt is made to test this important safety requirement.

Muscle Balance—the ability of the two eyes to point simultaneously and easily to the object to be seen. In many persons there is a tendency for at least one eye to point slightly upward or downward (vertical phorias) or to the right or left (lateral phorias). This interferes with good binocular vision and hampers acuity, depth perception and field of vision.

Good night vision is another important requirement, but tests for it are complex and the survey did not include glare resistance tests. Good night vision for driving depends on three abilities: resistance to being blinded by bright light; quick recovery after exposure to bright light, and ability to see under conditions of low illumination.

During the survey, drivers who normally wear glasses were tested with their driving glasses on in order to point out that persons required to wear glasses for driving need periodic examinations also.

Millions of drivers today are unaware that they have visual shortcom-

To Page 49

They're working for better vision

Rear Admiral Edwin J. Roland kicks off a Coast Guard vision program.

Texas Optometric Association volunteers tested eyes at a home show.

In Massachusetts volunteers offered the public the facts on vision.

GOOD VISION PROTECTS YOU

WHAT NEEDS TO BE DONE?

1. Public support of state officials in improving licensing standards, including through screening of all essential vision skills at the time of initial licensing of drivers.

2. Complete vision examinations for accident repeaters.

3. Periodic re-examination of vision for driving.

4. More extensive use of licensed vision specialists as consultants to licensing examiners, traffic courts and other government agencies dealing with highway safety.

5. Citizen action programs to remind drivers of the need for good driving vision and to encourage voluntary correction to the highest possible standards.

IN ANY kind of traffic—on lonely rural roads, on busy highways and expressways or traffic glutted city streets—good vision is a driving essential.

Authorities estimate that 90 per cent of the driving decisions you make are based on what you see. Common sense, then, tells us that good vision is an important factor in safety on our streets and highways.

But, the experts say, available research indicates that at least one driver out of five, with or without glasses, has vision defects which affect his or her driving abilities. And the ratio could be higher. Nearly half of today's drivers have never had an official eye test of any kind!

Fortunately, in 47 states driver license applicants must now pass at least some sort of test for visual acuity before being issued a permit to drive.

But there is still much progress to be made. The American Association of Motor Vehicle Administrators recommends a minimum 20/40 visual acuity as a requirement for a driver license. This means that applicants should be required to have at least the minimum ability to read at a distance of 20 feet the letters on a test chart which people with normal vision can read at a distance of 40 feet.

In spite of the expert recommendation of 20/40 vision as a minimum requirement, 20 states will still issue unrestricted licenses to drivers with 20/50 to 20/70 vision—with or without correction through glasses.

The importance of all this—even if you personally have the eyes of a hawk—is that there are thousands of drivers on the road who are a menace to your safety because *they* have poor vision.

And it's all so unnecessary!

With the aid of modern science, all but a few licensed motorists can have vision good enough for safe driving. The methods for improving driver vision are known, available and being applied—but not widely enough to solve the problem.

Many states issue a restricted license to applicants who cannot meet all minimum requirements. They may be licensed to drive provided they wear proper glasses, or if they drive only during daylight hours, or if accompanied by someone with adequate field of vision, etc. The purpose of license tests is not to eliminate drivers, but rather to enforce the highest possible level of driving skill on the part of every driver.

WHAT IS GOOD VISION?

DISTANCE ACUITY—Your ability to focus and see clearly with each eye separately and both eyes together, particularly at a distance of many feet or yards. Probably the most important vision skill for driving, it is essential for seeing danger, reading road signs in time and for general adaptation to driving conditions.

DEPTH PERCEPTION—The ability to correctly judge distances between yourself and other objects, especially when both are in motion. This is essential for passing other cars in the face of oncoming traffic and for maneuvering from one lane to another among moving vehicles on streets and highways. Deficiency in this skill is one of the most common defects found among drivers.

FIELD OF VISION—The ability to see over a large area without moving either your eyes or your head, sometimes called "looking out of the corners of your eyes." This is needed to detect crossroad traffic, pedestrians at the road side or intersections, to check traffic in the rear through mirrors and to get the general driving picture.

MUSCLE BALANCE—The ability to point your eyes simultaneously with ease at a given object. This is essential for good two-eyed vision, acuity, depth perception and field of vision.

NIGHT VISION SKILLS—The ability to see in the area of low illumination beyond your own headlights, to see against the glare of oncoming headlights, and the ability to recover quickly from glare. Night vision depreciates rapidly after 40 years of age. Inadequate night vision largely accounts for the fact that more accidents occur at night than during the daytime.

SOME DRIVING TIPS

To be a safe driver you must use your vision skills to develop safe driving habits, and you must compensate for vision defects. You must also remember that it takes time to see and more time to act.

If you have normal vision, you can perceive an unexpected obstacle only one-half as far away as you can see an expected one.

When you apply your brakes under average conditions at 70 m.p.h., your car will go more than 10 times the distance it takes to stop at 20 m.p.h. That's roughly 550 feet. On a dark highway, clear vision is limited to the effective length of your car's headlight beams, about 300 feet.

Obviously, then, if you need more than 300 feet to stop, you are overdriving your headlights—driving blind for all practical purposes. Under average conditions, the maximum safe speed at night is 50 m.p.h.

Night vision depreciates with age, so if you are over 40 you probably need to compensate by slowing down even more.

Never wear sun glasses to resist glare at night because they seriously reduce your vision.

HELP YOUR EYES

- **Have your vision examined periodically, with special reference to driving.**
- **Drive within your vision limitations, and be sure you know your limitations by consulting your eye doctor. Wear glasses if they have been prescribed.**
- **Cut down on night driving if you are troubled by glare or poor night vision. If you must drive at night, drive slowly.**
- **Compensate for poor field of vision by turning your head to watch for danger from the sides.**
- **Use extra care in passing other cars if your depth perception is inadequate.**
- **Remove from your windshield and dashboard unnecessary stickers, objects and decorations which might obscure your field of vision.**
- **Have your headlights checked periodically so they provide maximum light with each beam in the proper position.**

(Reprints of this Fact Sheet are available. See page 28.)

BOOSTERS

USE THESE AIDS . . .

Blunt instruments aren't necessary.
See *Children In The Car* (329.96-14)

Boat Trailers (329.96-2)
Driver Improvement Schools (329.96-3)
Traffic Law Uniformity (329.96-4)
Use of Turn Signals (329.96-5)
Your Responsibility in an Auto Accident (329.96-7)
The Man with a License to Kill (329.96-8)
Drinking and Driving (329.96-9)
Vote for Driver Education (Driver Education in High School) (329.96-10)
Stopping Distances (329.96-11)
How to Park Your Car (329.96-12)
Driving on Superhighways (329.96-13)
Children in the Car (329.96-14)
Traffic Courts on Trial (329.96-15)
Tips on Mountain Driving (329.96-16)
Is Your Car Sick, Sick, Sick? (Vehicle Maintenance) (329.96-17)
Smart Drivers Use Seat Belts (329.96-18)
Driving Tips From the Pros (329.96-19)
Yield Signs and Flashing Lights (329.96-20)
Uncontrolled Intersections (329.96-21)
Chemical Tests Protect You (329.96-22)
It's Called City Driving (329.96-23)
The Case For Traffic Enforcement (329.96-24)
Traffic Accident Facts (329.96-25)
Buying A Car? (329.96-26)
Night Driving (329.96-27)
Accident Records (329.96-28)
When Your Car Stalls (329.96-29)
Rural Driving (329.96-30)
Good Vision Protects You (329.96-31)

Order by title and stock no., e.g. **Boat Trailers** (329.96-2). TRAFFIC SAFETY reprint prices: minimum order 50, each: 50, $.05; 500, $.035; 1,000, $.028; 5,000, $.025; 10,000, $.02.

WORK FOR GOOD VISION

NSC AIDS

Safer Drivers Through Licensing—How driver licensing can improve the quality of drivers in your state, and how to get a better licensing program in your state. Including a proper vision examination as a license requirement. Two colors, four pages. Stock No. 329.17. In pkgs. of 100, each: 1, $2.90; 10, $2.50; 50, $2.30; 100, $2.20; 200, $2.10.

TRAFFIC SAFETY Fact Sheets

The Man With A License To Kill—Outlines the means and the goals of driver license improvements. Stock No. 329.96-8.

Stopping Distances—Gives the facts on how much room you need to stop at various speeds—hence, the distance you should be able to see ahead in order to avoid danger. Stock No. 329.96-11.

Uncontrolled Intersections—Covers the problem of what and how far away you should be able to see in order to safely negotiate uncontrolled intersections. Stock No. 329.96-21.

Night Driving—The visual and mechanical aids which can make night driving less hazardous. Stock No. 329.96-27.

Good Vision Protects You—The full story on why good vision for all drivers is a must for the safety of all. See pp. 26-27. Stock No. 329.96-31.

SIGNS TAKE A HOLIDAY

Signs Take A Holiday, now in its second printing, is catching on as the safety movie of the year. The movie has won wide acceptance.

And deservedly so.

The movie tells the story of what happens to a little guy when he wishes all signs would disappear. He soon learns the real message of the Signs of Life.

Your audience will also.

Send orders and inquiries to The National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

Price of single print copies of the 16mm

MATERIALS

ORDERS FOR NEW POSTERS SHOWN CANNOT BE SHIPPED UNTIL AFTER MAY 1

black and white sound film is $60.00 each; 2 to 9 copies, $55.00 each; 10 or more, $48.00 each. Order by Stock No. 379.42.

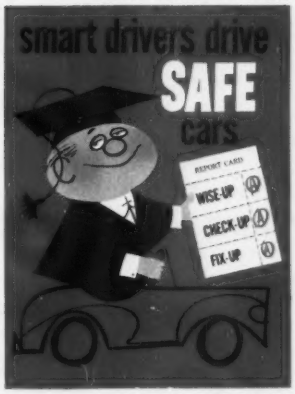
COMPANION LEAFLET

Five hundred free copies of the leaflet shown below will be given away free with each copy of the film purchased. The leaflet uses the original art from the movie.

The leaflets may also be purchased separately. In pkgs. of 100, each: 1 to 9, $2.00; 10 to 49, $1.40; 50 to 99, $1.30; 100 to 199, $1.20; 200 or more, $1.10. Stock No. 399.81.

SIGNS YOU MUST KNOW
Presented by the National Safety Council
A picture story about traffic signs taken from the movie, "Signs Take A Holiday."
Horace C. Heimerhoff is a mild mannered man—pleasant—polite—at peace with the world.
He is a good neighbor and a good citizen—and almost always obeys the law. But one day . . .
"Oh oh, what's the matter here? A parking ticket? But the sign says no parking, Horace."
"Traffic Signs —oooh how I hate 'em! Signs cramp my style. I wish there wasn't a sign in the whole world."

NEW TRAFFIC POSTERS FOR JUNE POSTING



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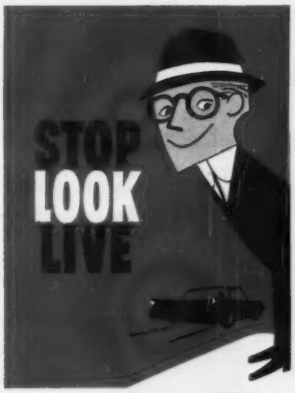
T-1883-A 8½x11½



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ALTERNATE POSTERS FOR JUNE POSTING

(These posters may be ordered for immediate delivery)

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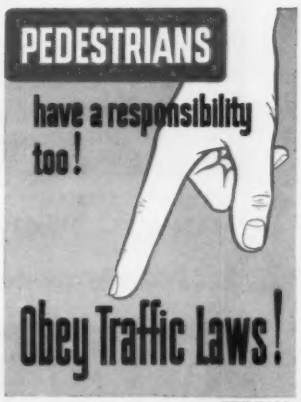
T-1618-C 25x38



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PRICES FOR ABOVE POSTERS

Traffic Posters—T-prefix to number

	1-9	10-99	100-999	1000-4999*
A Size	$0.17	$0.12	$0.07	$0.06
B Size	.30	.20	.165	.132
C Size	.40	.30	.24	.22

YOUR CREDIT LINE can be imprinted at time of the press run on Traffic B and C posters only. Orders for imprints on June posters above must be received by April 10, 1960.

Imprinting charges for these posters are $2.25 per lot plus an initial charge for each electroplate of $21.00 for C poster imprint and $12.50 for B poster imprint.

*Write for prices on quantities of 5,000 or more for special rates on annual poster orders.

PRICES SHOWN ARE SUBJECT TO A DISCOUNT OF 10% TO NATIONAL SAFETY COUNCIL MEMBERS

FLEET POSTERS

POSTER PRICES

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City Truck	City Bus	Annual price 1-4 sets, $9.90; 5-49, $7.80; 50 or more, $6.44.
Intercity Truck	Intercity Bus	
Sales Truck	Taxicab	
Truck Terminal	Bus Terminal	

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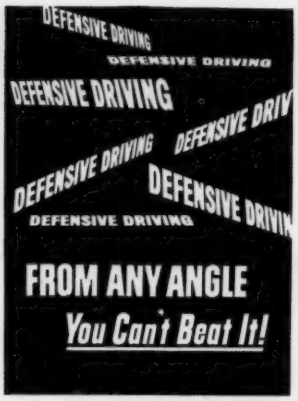
	1-9	10-99	100-999	1000-4999*
A size, any selection	.17	.12	.07	.06
B size, any selection	.32	.23	.195	.155

All prices shown are subject to a 10% discount to National Safety Council Members. *Write for prices on quantities of 5,000 or more. See page 29 for prices of posters with T-prefix.



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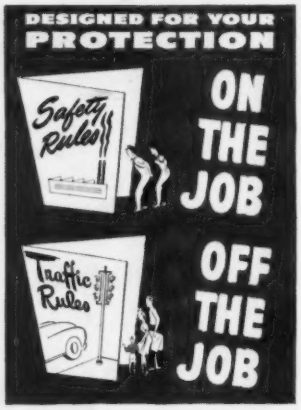
1634-A 8½x11½



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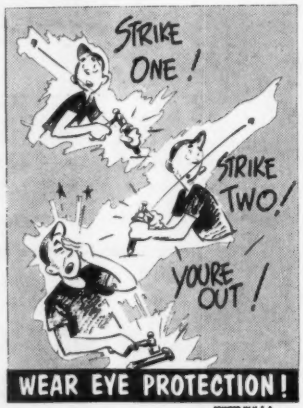

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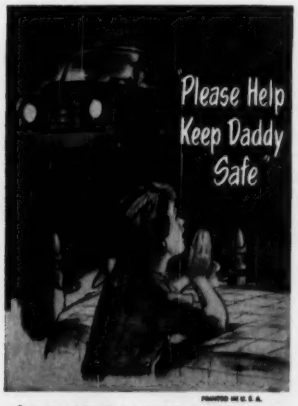

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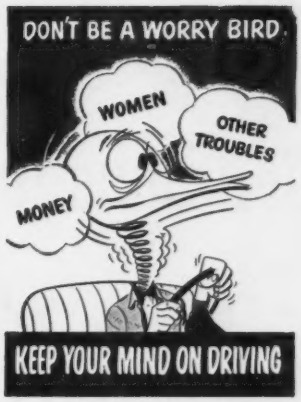

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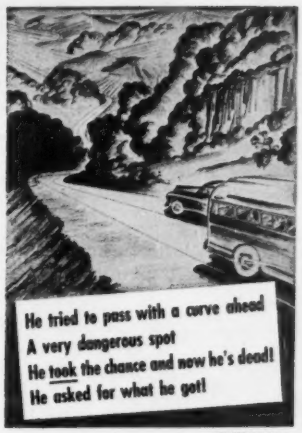

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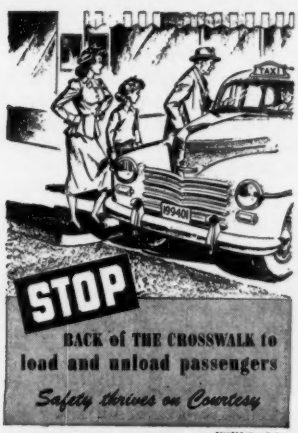

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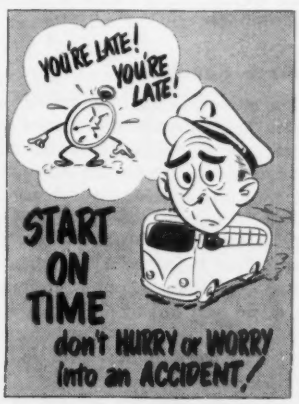

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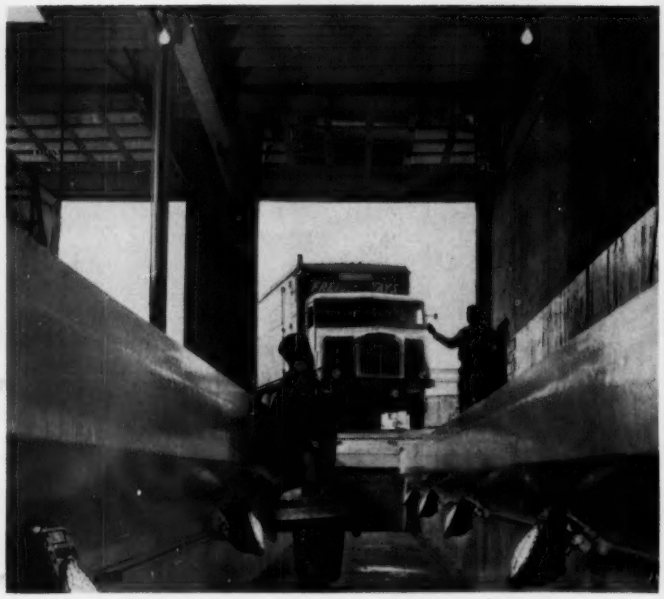
UNION'S PLACE IN A SAFETY PROGRAM

by John M. Elliott



Drivers appreciate safe equipment . . .

IT IS sad but true that in some quarters the view still persists that safety is solely a management concern and that the union has no place in a safety program. However, there is some hope that there will soon be universal acceptance of the view which has been receiving increased acceptance in recent years—the view that safety is as much a concern of the union as it is of the management, and that measures to improve safety are a wholly proper and necessary subject for collective bargaining between unions and managements.

In the transit industry the problem of how to reduce the hazards of accidents to the employes, the public, and the management has, of course, been a major problem since the inception of the industry. And from the time that my union, the Amalgamated, was organized 67 years ago it has seriously concerned itself with that problem. It is appropriate therefore, in considering what the union's place in a safety program should be, to consider first what this union has already done to help protect the public and the people who work in the industry against the wasteful and tragic consequences of accidents.

In examining these accomplishments of the past it is necessary that we broaden the usual concept of a "safety program." Usually when we think of a "safety program" we think of employe training sessions, inspection systems, performance awards, and all of the other formal measures that are taken by a management in an effort to teach the individual employe how to avoid accidents and to encourage him to do his job safely at all times.

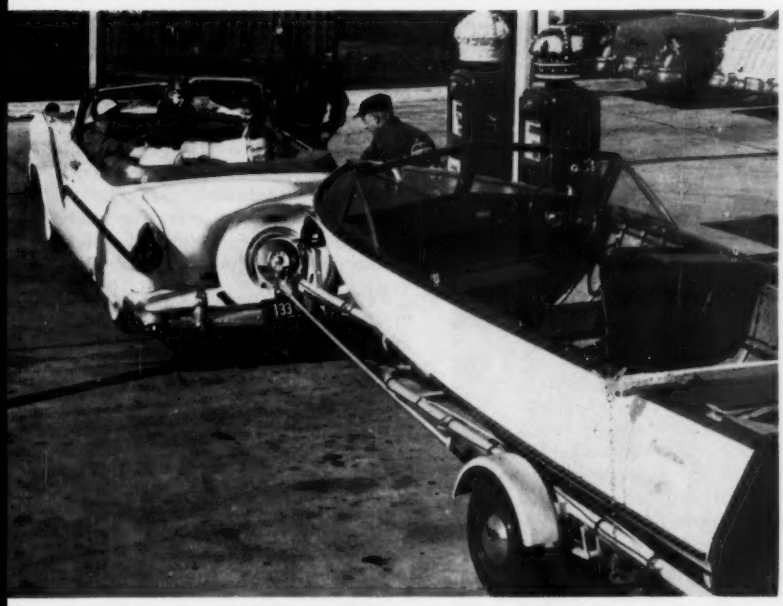
Improve Conditions

The union has a definite role in such safety training and enforcement programs, and I will have more to say about that role later. But it is not in that area that the union can make—and it is not in that area that the Amalgamated has made — its major contribution to safety in the transit industry. The finest training program in the world will fail to produce a really safe bus driver if that driver is required to work under conditions of employment that prevent him from obtaining the rest and relaxation that is so necessary to safe operation, and which make it necessary that he work when he is not physically up to par.

The most enticing system of safety awards will fail to produce a really safe bus driver if that driver is required to operate schedules that are too tight and induce him to drive at unsafe speeds. And no system for imparting safety education to the individual driver will avoid accidents which result from overcrowded vehicles or vehicles that are mechanically unsafe. It is in those areas that this union has made its chief contribution to safety, and it is not too much to say that the safety program in this industry really first had its start when the Amalgamated began to obtain for its members those improvements in the conditions of employment that go hand in hand with safety.

In 1938 the U. S. Public Health Service made a study of the effect of hours of service on the safety of a bus or truck driver's operation. The service came to the definite conclusion that long hours of driving have an adverse effect upon safety, and this resulted in the continuation and further refinement of the hours of service regulations of the I.C.C. But long before 1938 the Amalgamated had been keenly aware of the fact that fatigue which results from excessive

John M. Elliott is executive vice president of the Amalgamated Association of Street and Electric Railway Employes of America.



Vacations and other work benefits . . .

Workable schedules.

hours of driving is a major contributor to accidents, and some of its earliest efforts were directed at the reduction in the work day.

The Amalgamated was instrumental in securing passage as early as 1893 of legislation in Massachusetts which limited the hours per day of street railway employes. That legislation was the forerunner of laws passed in most of the other states, similarly limiting the hours in which an operator of a public transit vehicle can be required to drive. Such laws, however, have established only the bare minimum requirements, far below what is needed to provide adequate rest, particularly by an operator working under the stresses and strains of today's driving conditions. As a result, the union had to obtain further reductions through collective bargaining. It has been a difficult struggle, against all kinds of opposition, and complicated by the pressures created by the manpower shortages in World War II; but today a large portion of the employes in the industry are covered by labor agreements which provide for an eight-hour day.

The Amalgamated has also long recognized that the safety of driving is not only affected by the number of hours per day but also by the number per week. There is a cumulative fatigue which results from an excessively long work week even when the number of hours of driving per day is within safe limits. Our union has fought for the establishment of a five-day week in this industry. It has achieved that goal in a great many of the properties in the industry, and the extra period of rest that this has provided for the employes involved has most assuredly made for safer operation.

Swing Runs Hit

In this same general area, there is the problem of the spread of hours in a work day. In this industry, and particularly in local transit, the swing run has been used to take care of the problem of the morning and afternoon peak service. Before the union began to grapple with this problem, operators could be required to put in their driving time in the operation of two- or three-part swing runs over a spread of 16 to 18 hours or more from the time they first reported to the time they were relieved. Of necessity this kind of work day provides an inadequate period of time for rest, and creates a serious source of accident-provoking fatigue. Through the years the Amalgamated has, in collective bargaining, established contractual provisions which limit the use of swing runs, and reduce the spread of hours on such runs, and this too has served the cause of safety.

There are other provisions in our collective bargaining agreement related in many ways to safety. These include vacations, which provide an annual period of rest and physical rehabilitation; pensions, which retire the older driver and carry also the subtle but important impact of improved mental and emotional health due to the attendant sense of security resulting from the knowledge of the existence of such provisions. In similar fashion, health and welfare provisions and sick leave provisions have a desirable impact on the health of the employe and, hence, safety.

I do not intend to suggest that the desire to promote safety has been the union's sole motivation in obtaining the kind of improvements in working conditions that I have been describing.

That there may be more than one motive, however, does not change the plain fact that in striving for these improvements in the conditions under

which transit employes work the union has had, as one of its main purposes, the improvement of the safety of transit operations.

And that, as I see it, will continue to be the most significant and effective way in which this union can play a role in your safety programs. There are still too many places in which transit operators have a work day or a work week that is too long to be in the best interests of safety. There are still too many places in which the employes do not have the kinds of vacation, health and welfare benefits, and pensions that are necessary for a really effective safety program.

Will Work for Safety

This union will continue to strive for improvements in those areas in every part of the industry, firmly convinced that in so doing — whatever other ends are also served — it is surely serving the cause of safety.

I would not want to leave the subject of the union's role in promoting safety through collectively bargained improvements in hours, vacations and other related matters, however, without pointing out that there are, of course, other areas in which this union has advanced the cause of safety through collective bargaining. The Amalgamated has from the beginning sought to improve the safety of the equipment operated in the transit industry. It lead the fight, way back when, for legislation that required street car companies to enclose the vestibules of their cars, and for the installation of devices such as air brakes, that later became standard safety equipment.

We have urged in collective bargaining that operators should have the right to refuse to operate equipment that is unsafe and many of our contracts contain a specific provision to that effect. We have obtained clauses in our agreements that provide proper safety devices and protective clothing for employes in the maintenance shops, and we have insisted that the maintenance forces be adequately manned to assure that the equipment will be given the kind of care that is essential to safety.

But what about the formal safety training and enforcement programs . . . what role is the union able and willing to play in that approach to the problem of safety?

As a general answer to the question this much can be said without hesitation—this union stands ready at all times to cooperate with the management in developing and implementing programs designed to teach and to encourage our members to do their jobs more safely. We recognize that an important element in the avoidance of accidents is the teaching of specific techniques for safe operation and the development in each employe, through training and encouragement, of a never-ending safety-consciousness.

The union's support of such programs, and our participation in them, is fully in accord with the constitution and general laws of our association. I know of some transit systems in this country where such programs now in effect were originally instituted at the suggestion of this union.

I said we will cooperate in a legitimate, sincere and fair safety program, and I have used those adjectives advisedly, because not all such programs that now exist, or have existed, in this industry have met those three tests.

First, and most obviously, it must be a safety program that is in no way used to further some other wholly extraneous and improper purpose. One of the important psychological obstacles a management faces in obtaining the full support of the employes in a safety training program is that many such programs have a very unsavory past, the memory, if not the odor, of which has not been fully dissipated to this day.

Safety Abused

The hearings before the LaFollette Committee and other Congressional investigations that lead to the National Labor Relations Act are replete with examples of how so-called "safety meetings" had become a favorite forum for employers to tear down and undermine the union, to discourage by threats or promises the participation by the employes in collective action, and to disparage the whole process of collective bargaining. Those same investigations disclosed, as this union had known for years, that some managements had been using various so-called independent agencies, such as the infamous Railway Audit and Inspection Co., whose ostensible function was to check on fare and safety rule violations, but whose real purpose was to spy on the union activities of the employes, and to put the finger on those employes who were responsible for the development of union activity.

While such practices happily are not too common today they have not been wholly eradicated. Some transit managements are still using the safety meetings and the reports of safety checkers for improper purposes.

Even where this is not the practice, in attempting to sell the members on the idea of attendance at safety meetings, we have to overcome this heritage of the past which many of our members cannot so easily forget. In any event, it goes without saying that this union cannot possibly give its support to a safety program if there is any basis for believing that such a program is being used to interfere in any way with the organizational rights of our members.

Secondly, you cannot expect the union to support a safety program, and you cannot expect the employes to study safety and practice safety in their work, if the management is regularly engaged in practices that produce unsafe conditions, and is oblivious to the need to correct those conditions.

Need Safe Equipment Also

The employes will find little meaning in a program designed to encourage them to operate in accordance with all of the rules of safe driving if they see that the management has cut the maintenance forces to the bone, and that as a result of such a cut, or for any other reason, they are being asked to operate equipment that is not as safe as it should be.

The employes will not have their hearts in a program aimed at teaching them to follow the best rules for safe driving if they know that the management has cut the drivers and the service, and that as a result they are regularly subjected to the accident-provoking conditions of overcrowded vehicles and tight schedules or excessive overtime.

If you want your safety program to work; if you want the full support of the men and of this union in that program, show us that for you, as for us, safety isn't just a package of slo-

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IACP to Study Enforcement Weight

The field service division of the International Association of Chiefs of Police will undertake a study of the impact of police enforcement in improving driver behavior. The study, a three-year research project, will be financed with a grant of $209,515 from the Public Health Service of the federal Department of Health, Education and Welfare.

The study will furnish information to establish the best enforcement techniques influencing efficient flow of traffic and accident reduction.

Coming Events

From Page 11

April 12-14, Detroit, Mich.

Michigan State Safety Conference (Sheraton Cadillac Hotel). Contact Ben Duguid, All State Insurance Co., Box 5300, Seven Oaks Station, 16130 Northland Dr., Detroit 35, Mich.

April 12-14, Buffalo, N. Y.

Twentieth Western New York Safety Conference and Exhibit (Hotel Statler-Hilton). Contact Clifford H. Seymour, Western New York Safety Conference, Box 315, Niagara Falls, N. Y.

April 19-21, Columbus, Ohio

Thirtieth All-Ohio Safety Congress and Exhibit (Neil House). Contact Arthur W. Moon, Congress Manager, 3rd Floor, 400 S. Front St., Columbus 15, Ohio.

April 21-23, Boiling Springs, Pa.

Eleventh Annual Conference of the Pennsylvania Association for Safety Education. Contact Raymond M. Pecuch, Box 692, California, Pa.

April 27-28, Indianapolis, Ind.

Thirteenth Central Indiana Safety Conference and Exhibit (Claypool Hotel). Jack E. Gunnell, Indianapolis Chamber of Commerce Safety Council, 320 N. Meridian St., Indianapolis 11, Ind.

April 27-29, Gainesville, Fla.

Seventh Annual Conference on Accident Prevention Engineering (University of Florida). Contact Donald B. Wilcox, Conference Coordinator, University of Florida, College of Engineering, Gainesville, Fla.

Poster proudly announces that 35 drivers at U. S. Navy Supply Depot in Newport, R. I. have driven 1 million miles without a traffic accident.

40 TIMES AROUND WORLD WITHOUT AN ACCIDENT

The equivalent of forty times around the world is a considerable driving feat. Forty times around the world without an accident is a spectacular driving feat. Such a record has recently been compiled by the 35 drivers at the Naval Supply Depot, Newport, R. I.

Since October 28, 1957 NSD drivers have exceeded 1,000,000 miles of accident-free driving and, like the proverbial postman, their operating environment has frequently been less than ideal. But neither snow nor sleet nor New England fog has stayed the drivers from 551 consecutive days of accident-free driving.

The record was not achieved "by accident" but was attained through continuous training lectures, safety films, and an innovation—the five-minute, stand-up safety talk. The safety talk was required for each driver and branch supervisor. It kept them from taking safety for granted. Periodic and complete physical examinations were given. Safe driver awards were promptly presented, and, finally, the important contribution that transportation made to the mission of the depot was continually recognized and emphasized by top management.

The drivers realize that they have specific responsibilities. They must keep themselves physically sound. They must have the technical knowledge to check the condition of their vehicles and insure that they are properly loaded.

The drivers are currently undergoing a comprehensive first aid course that will enable them to aid accident victims encountered on the road. Each truck cab has been equipped with a first aid kit, a flashlight, and a hand fire extinguisher. Combine this equipment with first aid know-how, and you have a modern-day road Samaritan.

Captain Brown, the commanding officer of the depot and Rod Lussier, safety program specialist, are proud of the 316 safe-driving years and are particularly proud of John Bouchard, the top driver, who has 16 consecutive accident-free years behind the wheel. They know that safety has meant lower operating costs, fewer claims for damaged goods, less lost-time accidents, and less down-time for vehicular repairs.

News from Capitol Hill

SAFETY became an immediate issue in the second session of the 86th Congress, which convened under the shadow of the forthcoming presidential election campaign.

Traffic Safety

Congressman Kenneth A. Roberts, chairman of the Subcommittee on Health and Safety of the House Committee on Interstate and Foreign Commerce, outlined his views and plans:

"It is apparent that persuasion is not enough," he said. "Something more than logic is needed. . . . We are not going to stop this needless slaughter with slogans. Lectures are not enough. Good intentions are not enough." He said that as a Southerner he cherished the doctrine of state rights; but "if we are going to get the job done, we can not selfrighteously hide behind the cloak of state rights, or reject steps which are going to cost money." He asked: ". . . In view of the record, can we afford to wait for the states to do this?" His own answer was: "It was with the greatest reluctance that I came to the conclusion that we needed" federal legislation.

Roberts outlined "the major things I think we must do, and soon, to reduce the traffic toll:

"1. We must have legislation to establish minimum safety standards for passenger-carrying motor vehicles bought for government use.

"2. More emphasis must be placed on driver education, to combat lawlessness which contributes to juvenile delinquency and to reduce the accident toll in the age bracket where casualties are heaviest.

"3. We must continue to urge the adoption of uniform driving rules to apply from coast to coast . . . to eliminate dangerous confusion and to plug loopholes contributing to the accident toll.

"4. We must spend more on research. Only by research have we made substantial progress against epidemics and mass killers in the public health field, and here we are dealing with one of the major public health problems of our time."

For all of these objectives but the third (uniform driving rules), Roberts saw the need for federal action. But he also warned: "It may be that we shall have to go further than that in enacting federal legislation." He asked for public support for his legislative program.

The Congressman warned that the necessary measures to cope with traffic accidents are "going to cost us money." Such a program also "may mean a certain curtailment of some of our freedom of action. It may mean that some of those who enjoy driving may have to give up driving. It may mean sending some worn-out and unsafe cars to the junk pile. Driving is a privilege and not a right. No one who endangers the life and property of his neighbor has a right to drive."

Motor Transportation

The Interstate Commerce Commission announced it would conduct an investigation of practices of motor carriers in permitting drivers to drive when fatigued and for periods beyond the maximum driving time authorized by Commission regulations.

The ICC also proposed a reappraisal and re-examination of its existing rules and regulations relating to the transportation of explosives and other dangerous articles, in order to determine what revisions or amendments can be made under existing authority, or if need be, "to seek legislation with a view to the removal or lessening of the hazards attendant in the transportation of these commodities and the establishment of additional safeguards for their transportation." Both proposals emanated from investigations of specific motor carrier accidents.

National Homemakers Open Safety Conference

National and state leaders of home demonstration councils and cooperative extension services gathered at Michigan State University in January to learn what women can do for traffic safety.

As delegates to the first national safety conference called by the National Home Demonstration Council, they represented an advance guard of an army of 40,000 women who are making traffic safety their major project for 1960 and upcoming years.

Some 40 states were represented at the conference, which was financed by a grant of $20,000 from Allstate Foundation. Each state was invited to send the leader of its home economics extension program and the safety chairman of the state home demonstration council to the three-day conference which constituted a school of traffic safety instruction. Also attending were national officers and regional leaders of the NHDC, the national directors of the women's division of the President's Committee for Traffic Safety, and directors of women's divisions of Allstate Foundation, the Automotive Safety Foundation and the National Safety Council.

Co-sponsors of the conference were Michigan State University's cooperative extension service, college of home economics, continuing education services and highway traffic safety center. Center staff members reviewed various aspects of the traffic safety problem and provided detailed information on action programs which delegates could introduce in their home states and communities.

Special reports on safety projects which have worked successfully in various communities were also presented.

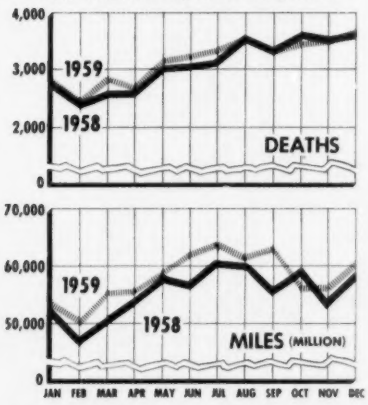
Delegates drafted recommendations for safety action at home with activities expected to reach 120,000 women annually.

From Page 9

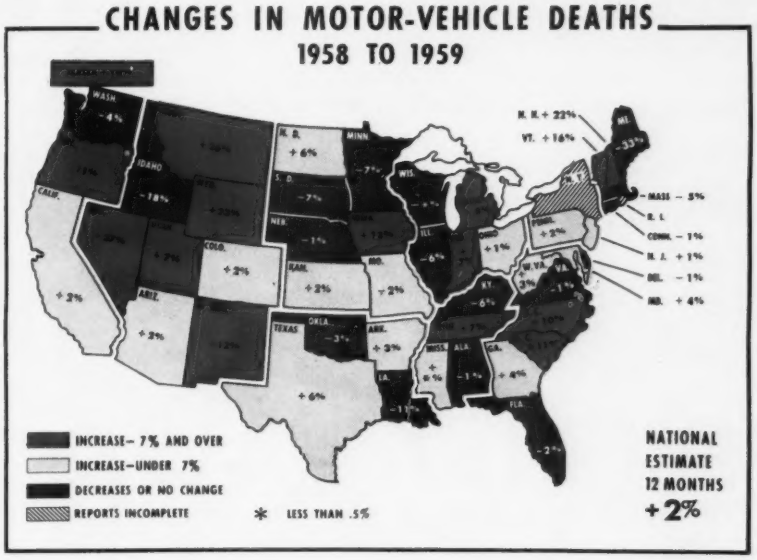
lation size group, ranked according to deaths per 10,000 registered vehicles were:

	Reg. Rate	Pop. Rate
Group I (1,000,000 and over)		
Detroit, Mich.	2.8	9.5
Los Angeles, Calif.	2.9	15.7
Chicago, Ill.	3.0	8.0
Group II (750,000 to 1,000,000)		
St. Louis, Mo.	2.7	9.8
Washington, D. C.	2.7	7.3
San Francisco, Calif.	2.9	11.0
Group III (500,000 to 750,000)		
Milwaukee, Wis.	1.5	6.5
Seattle, Wash.	1.9	9.4
Buffalo, N. Y.	2.2	8.2
Group IV (350,000 to 500,000)		
Denver, Colo.	1.9	11.1
Portland, Ore.	2.1	12.1
San Antonio, Tex.	2.3	10.8
Group V (200,000 to 350,000)		
Wichita, Kan.	0.7	4.5
Rochester, N. Y.	1.0	4.1
Toledo, Ohio	1.2	5.2
Group VI (100,000 to 200,000)		
Yonkers, N. Y.	0.4	1.1
Rockford, Ill.	0.6	3.3
South Bend, Ind.	0.6	3.0
Group VII (50,000 to 100,000)		
Evanston, Ill.	0.0	0.0
Parma, Ohio	0.0	0.0
Ann Arbor, Mich.	0.3	1.8
Group VIII (25,000 to 50,000)		
Tallahassee, Fla.	0.0	0.0
Boise, Idaho	0.0	0.0
Newark, Ohio	0.0	0.0
Group IX (10,000 to 25,000)		
Santa Cruz, Calif.	0.0	0.0
Austin, Minn.	0.0	0.0
Edina, Minn.	0.0	0.0

MONTHLY MOTOR VEHICLE DEATHS AND TRAFFIC TRENDS 1958-1959



CHANGES IN MOTOR-VEHICLE DEATHS 1958 TO 1959



MOTOR VEHICLE DEATHS AND CHANGES

Months	DEATHS				PERCENTAGE CHANGES		
					Corresponding Month		4 Months Moving Ave.*
	1956	1957	1958	1959	1956-1959	1958-1959	1958-1959
January	2,954	2,882	2,710	2,760	— 7%	+ 2%	— 1%
February	2,652	2,508	2,390	2,420	— 9%	+ 1%	— 2%
March	2,940	2,843	2,590	2,810	— 4%	+ 8%	+ 1%
April	2,970	2,933	2,600	2,700	— 9%	+ 4%	+ 4%
May	3,094	3,065	2,950	3,150	+ 2%	+ 7%	+ 5%
June	3,338	3,302	3,070	3,230	— 3%	+ 5%	+ 6%
July	3,555	3,308	3,110	3,260	— 8%	+ 5%	+ 5%
August	3,535	3,635	3,550	3,550	0%	0%	+ 4%
September	3,653	3,365	3,320	3,320	— 9%	0%	+ 2%
October	3,476	3,466	3,600	3,450	— 1%	— 4%	0%
November	3,603	3,620	3,510	3,490	— 3%	— 1%	— 1%
December	3,858	3,775	3,600	3,660	— 5%	+ 2%	— 1%
Total	39,628	38,702	37,000	37,800	— 5%	+ 2%	

All 1956 and 1957 figures are from the National Office of Vital Statistics. The 1958 and 1959 figures are National Safety Council estimates.

The 1959 national estimate is arrived at by assuming that the percentage change from 1958 to 1959 in the states reporting for both years reflects the 1958-1959 change in the entire country. First reports are preliminary, so revisions are made from time to time as later reports are received for the various months. Thus, figures above for 1959 may differ slightly from the figures for the same months which will be published in future issues of TRAFFIC SAFETY.

*Four Months Moving Average is based on changes between the totals for four months instead of one month. For example, the December figure shows the change between the totals for September-December, 1958 and September-December, 1959, etc. Adding several months together tends to smooth out single month changes which may be affected by differences in the number of weekends in a month from one year to the next, random variations, etc.

TRAFFIC DEATHS—CITY RECORDS

The table covers only motor-vehicle deaths resulting from traffic accidents that occurred in the city. Nontraffic motor-vehicle deaths (where the accident occurred on home or work premises) are not included, nor are deaths in the city from accidents occurring outside.

Rankings are based on the 1959 registration death rate which is the number of deaths per 10,000 registered motor vehicles on an annual basis. Vehicle registration figures are for the year 1959 and were supplied by R. L. Polk & Company.

Cities are ranked by registration death rates—from low to high. When two or more cities have exactly the same rate, ranking is by total vehicle registrations—from large to small.

Cities shown in heavy type have improved in 1959 compared with 1958.

The population death rate is the number of deaths per 100,000 population on an annual basis. Populations are as of April, 1950, or later censuses taken by the U. S. Bureau of the Census.

	Twelve Months 1959	1958	1957	1959 Reg. Rate	1959 Pop. Rate
ALL REPORTING CITIES				2.3	9.3
Group I (1,000,000 and over)					
1. Detroit, Mich.	184	156	179	2.8	9.5
2. Los Angeles, Calif.	**353**	**373**	**399**	**2.9**	**15.7**
3. Chicago, Ill.	**300**	**308**	**326**	**3.0**	**8.0**
4. Philadelphia, Pa.	162	162	173	3.2	7.8
5. Baltimore, Md.	**103**	**107**	**109**	**3.2**	**10.0**
All cities in this group				3.5	9.6
6. New York, N. Y.	705	627	629	5.1	9.0
Group II (750,000 to 1,000,000)					
1. St. Louis, Mo.	84	83	81	2.7	9.8
2. Washington, D. C.	**61**	**62**	**69**	**2.7**	**7.3**
3. San Francisco, Calif.	85	80	84	2.9	11.0
All cities in this group				2.9	9.5
4. Cleveland, Ohio	**93**	**95**	**115**	**3.2**	**10.0**
Group III (500,000 to 750,000)					
1. Milwaukee, Wis.	46	41	42	1.5	6.5
2. Seattle, Wash.	**54**	**72**	**49**	**1.9**	**9.4**
3. Buffalo, N. Y.	**49**	**61**	**58**	**2.2**	**8.2**
4. Minneapolis, Minn.	44	46	48	2.2	8.4
5. Dallas, Tex.	72	73	71	2.4	12.4
6. Cincinnati, Ohio	53	59	62	2.4	9.2
All cities in this group				2.5	10.1
7. Houston, Tex.	109	83	102	2.6	15.3
8. Pittsburgh, Pa.	**56**	**69**	**58**	**2.8**	**8.3**
9. Boston, Mass.	**52**	**58**	**60**	**3.1**	**7.2**
10. New Orleans, La.	**69**	**73**	**71**	**3.8**	**11.5**
11. San Diego, Calif.	**80**	**90**	**66**	**4.0**	**16.0**
Group IV (350,000 to 500,000)					
1. Denver, Colo.	53	42	36	1.9	11.1
2. Portland, Ore.	50	44	47	2.1	12.1
3. San Antonio, Tex.	**49**	**55**	**60**	**2.3**	**10.8**
4. Indianapolis, Ind.	51	32	37	2.3	11.0
5. Columbus, Ohio	**40**	**46**	**48**	**2.3**	**8.3**
6. Memphis, Tenn.	44	31	34	2.5	9.0
All cities in this group				2.7	11.5
7. Louisville, Ky.	53	52	37	3.4	13.0
8. Kansas City, Mo.	54	36	31	3.5	11.2
9. Birmingham, Ala.	50	41	40	3.5	14.0
10. Atlanta, Ga.	**74**	**76**	**72**	**3.9**	**15.0**
Group V (200,000 to 350,000)					
1. Wichita, Kan.	**10**	**13**	**18**	**0.7**	**4.5**
2. Rochester, N. Y.	**14**	**26**	**24**	**1.0**	**4.1**
3. Toledo, Ohio	**18**	**20**	**34**	**1.2**	**5.2**
4. Providence, R. I.	15	15	16	1.2	6.0
5. Flint, Mich.	15	11	16	1.2	6.0
6. Tulsa, Okla.	18	15	18	1.3	8.1
7. Grand Rapids, Mich.	18	18	18	1.5	8.5
8. Syracuse, N. Y.	**12**	**13**	**12**	**1.6**	**5.6**
9. Jacksonville, Fla.	**25**	**37**	**20**	**1.6**	**10.0**
10. Norfolk, Va.	**15**	**20**	**10**	**1.6**	**5.2**
11. Dayton, Ohio	25	24	28	1.7	8.5
12. Oklahoma City, Okla.	30	24	26	1.7	10.5
13. Long Beach, Calif.	**28**	**38**	**59**	**1.8**	**8.3**
All cities in this group				1.8	8.7
14. Richmond, Va.	**23**	**30**	**22**	**1.9**	**9.7**
15. St. Paul, Minn.	**29**	**32**	**35**	**2.0**	**9.3**
16. Miami, Fla.	45	43	38	2.1	17.4
17. Fort Worth, Tex.	**36**	**43**	**33**	**2.2**	**10.9**
18. Tampa, Fla.	32	31	24	2.3	11.9
19. Omaha, Neb.	28	23	24	2.4	10.1
20. Akron, Ohio	**40**	**42**	**60**	**3.1**	**13.0**
21. Worcester, Mass.	20	13	11	3.5	9.9
Group VI (100,000 to 200,000)					
1. Yonkers, N. Y.	**2**	**8**	**5**	**0.4**	**1.1**
2. Rockford, Ill.	**4**	**10**	**11**	**0.6**	**3.3**
3. South Bend, Ind.	**4**	**9**	**10**	**0.6**	**3.0**
4. Saginaw, Mich.	**5**	**6**	**12**	**0.9**	**4.6**
5. Trenton, N. J.	**7**	**9**	**8**	**0.9**	**5.5**
6. New Haven, Conn.	9	6	11	0.9	5.4
7. Corpus Christi, Tex.	**7**	**21**	**16**	**1.0**	**4.8**
8. Peoria, Ill.	7	6	9	1.1	6.1
9. Tacoma, Wash.	**10**	**14**	**15**	**1.1**	**6.3**
10. Knoxville, Tenn.	**7**	**8**	**7**	**1.1**	**5.6**
11. Wilmington, Del.	**8**	**10**	**8**	**1.3**	**7.2**
12. Niagara Falls, N. Y.	**5**	**8**	**4**	**1.3**	**4.8**
13. Hartford, Conn.	8	4	4	1.4	4.3
14. Canton, Ohio	9	8	13	1.4	7.3
15. Lincoln, Neb.	7	6	4	1.4	5.9
16. Berkeley, Calif.	**7**	**10**	**9**	**1.4**	**5.9**
17. Madison, Wis.	8	6	5	1.5	7.2
18. Salt Lake City, Utah	**19**	**21**	**15**	**1.5**	**9.9**
19. Spokane, Wash.	**14**	**20**	**22**	**1.5**	**7.4**
20. Springfield, Mass.	**9**	**15**	**8**	**1.5**	**5.4**
21. Waterbury, Conn.	6	5	5	1.5	5.3
22. Reading, Pa.	**7**	**8**	**12**	**1.6**	**6.1**
23. Dearborn, Mich.	**12**	**25**	**26**	**1.6**	**9.3**
24. Utica, N. Y.	6	5	9	1.7	5.8
25. Montgomery, Ala.	9	5	2	1.7	7.7
26. Lansing, Mich.	10	7	9	1.7	8.9
27. Amarillo, Tex.	10	2	8	1.8	10.0
28. Des Moines, Iowa	17	17	16	1.8	9.3
29. Bridgeport, Conn.	11	7	15	1.8	6.5
30. Roanoke, Va.	8	8	10	1.8	7.9
31. Nashville, Tenn.	**16**	**22**	**13**	**1.9**	**9.2**
32. Newport News, Va.	**6**	**14**	**13**	**1.9**	**5.7**
33. Pasadena, Calif.	**13**	**14**	**21**	**1.9**	**11.4**
34. Glendale, Calif.	11	6	13	2.0	9.6
35. Fresno, Calif.	17	9	15	2.0	13.8
36. Gary, Ind.	**14**	**15**	**17**	**2.0**	**7.9**
All cities in this group				2.0	9.4
37. Fort Wayne, Ind.	17	8	11	2.1	11.1
38. Kansas City, Kan.	15	6	10	2.1	11.6
39. Little Rock, Ark.	**11**	**13**	**10**	**2.1**	**10.3**
40. Shreveport, La.	17	8	12	2.2	10.6
41. Arlington, Va.	14	8	8	2.2	8.8
42. Austin, Tex.	17	9	11	2.3	10.3
43. Duluth, Minn.	**10**	**21**	**16**	**2.3**	**9.5**
44. Elizabeth, N. J.	**9**	**10**	**13**	**2.3**	**7.7**
45. Allentown, Pa.	11	7	7	2.3	9.8
46. St. Petersburg, Fla.	25	21	26	2.4	18.8
47. Savannah, Ga.	13	7	16	2.4	9.9
48. San Jose, Calif.	26	25	22	2.4	16.4
49. Jackson, Miss.	14	7	9	2.5	11.9
50. Evansville, Ind.	16	8	14	2.5	9.5
51. Baton Rouge, La.	20	16	11	2.7	13.3
52. Youngstown, Ohio	20	12	20	3.0	10.8
53. Charlotte, N. C.	24	20	20	3.1	15.4
54. Chattanooga, Tenn.	23	20	18	3.6	17.6
55. Phoenix, Ariz.	47	31	23	3.7	29.4
56. Hammond, Ind.	**14**	**20**	**21**	**3.8**	**12.8**
57. Lubbock, Tex.	25	10	4	4.5	23.8
58. Mobile, Ala.	32	23	24	4.6	18.4
Group VII (50,000 to 100,000)					
1. Evanston, Ill.	0	0	4	0.0	0.0
2. Parma, Ohio	**0**	**2**	**4**	**0.0**	**0.0**
3. Ann Arbor, Mich.	**1**	**3**	**1**	**0.3**	**1.8**
4. Lorain, Ohio	**1**	**7**	**9**	**0.3**	**1.6**
5. Oak Park, Ill.	**1**	**3**	**3**	**0.4**	**1.6**
6. Elmira, N. Y.	1	0	3	0.5	1.9
7. Euclid, Ohio	**1**	**5**	**4**	**0.5**	**1.6**
8. Dubuque, Iowa	1	0	2	0.5	1.9
9. Medford, Mass.	**1**	**6**	**5**	**0.5**	**1.5**
10. Bloomfield, N. J.	1	0	5	0.5	2.0
11. Racine, Wis.	2	2	1	0.5	2.4
12. Berwyn, Ill.	**2**	**4**	**2**	**0.7**	**3.8**
13. Battle Creek, Mich.	2	2	7	0.7	3.6
14. Kalamazoo, Mich.	**3**	**4**	**6**	**0.8**	**4.0**
15. Cedar Rapids, Iowa	**3**	**4**	**7**	**0.8**	**3.8**
16. Schenectady, N. Y.	4	4	5	0.8	4.1
17. Wheeling, W. Va.	**2**	**6**	**8**	**0.8**	**3.4**
18. Springfield, Ill.	**4**	**6**	**3**	**0.9**	**4.9**
19. Lancaster, Pa.	3	3	4	0.9	4.4
20. Joliet, Ill.	**3**	**8**	**6**	**0.9**	**5.0**
21. Colorado Spgs., Colo.	4	4	4	0.9	6.4
22. Reno, Nev.	**3**	**8**	**2**	**0.9**	**5.7**
23. Bethlehem, Pa.	3	0	10	0.9	4.1
24. San Mateo, Calif.	**3**	**4**	**4**	**0.9**	**4.5**
25. Fort Lauderdale, Fla.	**5**	**7**	**4**	**1.0**	**7.9**
26. Muskegon, Mich.	3	3	8	1.0	5.2
27. Cuyahoga Falls, Ohio	**2**	**4**	**1**	**1.0**	**4.0**
28. Mount Vernon, N.Y.	3	2	2	1.1	3.9
29. Passaic, N. J.	2	2	4	1.1	3.5
30. Portland, Maine	**3**	**8**	**7**	**1.1**	**3.7**
31. East Orange, N. J.	**3**	**4**	**8**	**1.1**	**3.5**
32. Binghamton, N. Y.	4	3	6	1.1	4.8
33. Pensacola, Fla.	**4**	**5**	**1**	**1.1**	**7.8**
34. Terre Haute, Ind.	**4**	**6**	**3**	**1.1**	**5.5**
35. Raleigh, N. C.	**4**	**6**	**4**	**1.2**	**5.6**
36. Wilkes-Barre, Pa.	**4**	**6**	**3**	**1.2**	**5.2**
37. New Rochelle, N.Y.	3	3	1	1.2	4.0
38. Covington, Ky.	3	3	7	1.2	4.1
39. Fullerton, Calif.	**3**	**6**	**6**	**1.3**	**5.9**
40. Bay City, Mich.	4	3	3	1.3	6.6
41. Bayonne, N. J.	3	2	6	1.3	3.9
42. Hayward, Calif.	**5**	**8**	**6**	**1.3**	**9.1**
43. Asheville, N. C.	4	4	7	1.3	7.5
44. Anderson, Ind.	4	3	3	1.4	7.9
45. Mansfield, Ohio	4	3	4	1.4	7.6
46. St. Clair Shores, Mich.	4	4	1	1.4	6.4
47. Lynchburg, Va.	**3**	**9**	**5**	**1.4**	**5.6**
48. White Plains, N. Y.	4	3	2	1.4	7.9
49. Columbia, S. C.	7	5	12	1.4	7.3
50. Augusta, Ga.	5	5	3	1.4	6.7
51. Orlando, Fla.	11	0	5	1.5	12.3
52. Greenville, S. C.	5	4	8	1.5	7.7
53. Lexington, Ky.	5	4	5	1.5	7.5
54. New Britain, Conn.	**4**	**7**	**2**	**1.5**	**4.6**
55. Lincoln Park, Mich.	**3**	**4**	**8**	**1.5**	**5.5**
56. Johnstown, Pa.	5	3	6	1.5	7.8
57. Jackson, Mich.	5	3	5	1.5	8.2
58. Winston-Salem, N.C.	**7**	**12**	**12**	**1.6**	**7.7**
59. Meriden, Conn.	3	2	6	1.6	5.8
60. Stamford, Conn.	6	4	5	1.6	6.9
61. Sioux Falls, S. D.	5	3	7	1.7	8.4
62. Manchester, N. H.	5	4	3	1.7	5.7
63. East Chicago, Ind.	**3**	**5**	**7**	**1.7**	**5.0**
64. San Leandro, Calif.	**6**	**8**	**6**	**1.7**	**9.4**
65. Santa Ana, Calif.	9	1	10	1.8	13.0
66. Warren, Ohio	6	5	5	1.8	9.5
67. Santa Barbara, Calif.	7	7	2	1.9	12.6
68. Abilene, Tex.	7	2	3	1.9	11.5
All cities in this group				1.9	9.0
69. Huntington, W. Va.	7	6	10	2.0	8.1
70. Lwr. Merion Twp., Pa.	4	3	4	2.0	6.9
71. Springfield, Ohio	8	6	6	2.0	9.1
72. Aurora, Ill.	6	3	6	2.0	10.4
73. Norwalk, Conn.	**4**	**7**	**11**	**2.0**	**6.5**
74. Macon, Ga.	9	3	10	2.0	12.8
75. Topeka, Kan.	11	10	9	2.0	13.3
76. Waukegan, Ill.	5	2	4	2.0	9.9
77. Pontiac, Mich.	**9**	**15**	**4**	**2.0**	**10.8**
78. Lake Charles, La.	6	5	4	2.1	10.7
79. Lakewood, Ohio	**5**	**6**	**3**	**2.1**	**7.1**
80. Decatur, Ill.	**9**	**14**	**7**	**2.1**	**11.4**
81. Hamilton, Ohio	8	7	5	2.1	11.0
82. Waterloo, Iowa	**7**	**10**	**5**	**2.1**	**10.0**
83. Springfield, Mo.	9	3	9	2.1	11.3
84. Santa Monica, Calif.	**7**	**9**	**13**	**2.1**	**9.2**
85. Alexandria, Va.	9	4	7	2.2	10.3
86. Cambridge, Mass.	**6**	**8**	**3**	**2.2**	**6.1**
87. Waltham, Mass.	4	5	3	2.2	8.0
88. Gadsden, Ala.	**4**	**6**	**4**	**2.2**	**6.2**
89. Pawtucket, R. I.	6	2	2	2.2	6.9
90. Pueblo, Colo.	10	2	6	2.2	12.1
91. Miami Beach, Fla.	7	7	6	2.2	13.7
92. West Hartford, Conn.	4	4	2	2.2	6.9
93. Council Bluffs, Iowa	5	4	2	2.2	9.4
94. Alameda, Calif.	6	1	1	2.2	8.3
95. Torrance, Calif.	11	7	8	2.3	11.3
96. Green Bay, Wis.	7	6	6	2.3	12.8
97. West Allis, Wis.	**4**	**5**	**3**	**2.3**	**6.4**
98. San Angelo, Tex.	6	4	9	2.3	10.9
99. Stockton, Calif.	**13**	**14**	**22**	**2.3**	**17.1**
100. Compton, Calif.	**8**	**10**	**11**	**2.3**	**12.6**
101. Davenport, Iowa	8	4	6	2.3	9.9
102. Wichita Falls, Tex.	9	8	4	2.3	9.9
103. Ogden, Utah	9	7	6	2.4	13.8
104. Durham, N. C.	9	9	6	2.6	12.6
105. Riverside, Calif.	12	6	13	2.7	15.9
106. Richmond, Calif.	9	5	5	2.7	9.0
107. Burbank, Calif.	13	9	5	2.7	14.3
108. Tucson, Ariz.	16	9	14	2.9	22.9
109. Royal Oak, Mich.	11	1	7	2.9	15.4
110. Brookline, Mass.	**5**	**9**	**3**	**3.0**	**8.8**
111. Muncie, Ind.	11	3	3	3.0	16.8
112. Columbus, Ga.	12	8	4	3.2	13.4
113. Greensboro, N. C.	**13**	**18**	**11**	**3.3**	**16.0**

	Twelve Months 1959	1958	1957	1959 Reg. Rate	1959 Pop. Rate
114. Atlantic City, N.J.	**6**	**10**	**8**	**3.4**	**9.7**
115. Brockton, Mass.	**8**	**9**	**6**	**3.4**	**12.8**
116. Charleston, S. C.	7	4	3	3.4	10.0
117. Woonsocket, R. I.	6	1	4	3.4	12.0
118. Lynn, Mass.	9	5	0	3.4	9.1
119. Kenosha, Wis.	11	2	1	3.5	16.9
120. Warren, Mich.	12	8	7	3.6	18.9
121. Beaumont, Tex.	18	9	13	3.6	19.1
122. Hampton, Va.	**9**	**15**	**11**	**3.6**	**11.2**
123. San Bernardino, Calif.	23	20	16	3.9	27.7
124. St. Joseph, Mo.	12	2	2	4.0	15.3
125. Tuscaloosa, Ala.	9	3	3	4.2	15.8
126. Charleston, W. Va.	13	11	4	4.4	17.7
127. Anaheim, Calif.	24	2	11	4.9	30.6
128. Sioux City, Iowa	17	9	8	5.0	19.1
129. Fort Smith, Ark.	12	11	11	5.1	20.0
130. Greenwich, Conn.	8	3	9	5.2	15.5

Group VIII (25,000 to 50,000)

1. Tallahassee, Fla.	**0**	**5**	**1**	**0.0**	**0.0**
2. Boise, Idaho	0	0	1	0.0	0.0
3. Newark, Ohio	**0**	**5**	**6**	**0.0**	**0.0**
4. Elyria, Ohio	**0**	**3**	**2**	**0.0**	**0.0**
5. Rochester, Minn.	**0**	**3**	**2**	**0.0**	**0.0**
6. West Covina, Calif.	**0**	**4**	**5**	**0.0**	**0.0**
7. Bellingham, Wash.	**0**	**3**	**1**	**0.0**	**0.0**
8. Fargo, N. D.	**0**	**4**	**1**	**0.0**	**0.0**
9. Barberton, Ohio	**0**	**10**	**5**	**0.0**	**0.0**
10. Michigan City, Ind.	**0**	**6**	**5**	**0.0**	**0.0**
11. Burlington, Iowa	**0**	**2**	**4**	**0.0**	**0.0**
12. Westfield, N. J.	**0**	**2**	**1**	**0.0**	**0.0**
13. Milford, Conn.	**0**	**5**	**4**	**0.0**	**0.0**
14. Park Ridge, Ill.	**0**	**1**	**4**	**0.0**	**0.0**
15. Manitowoc, Wis.	**0**	**4**	**2**	**0.0**	**0.0**
16. Walla Walla, Wash.	**0**	**2**	**1**	**0.0**	**0.0**
17. Bristol, Conn.	**0**	**2**	**4**	**0.0**	**0.0**
18. Mt. Clemens, Mich.	**0**	**3**	**2**	**0.0**	**0.0**
19. Kettering, Ohio	0	0	7	0.0	0.0
20. Webster Groves, Mo.	0	0	2	0.0	0.0
21. Fairmont, W. Va.	**0**	**3**	**4**	**0.0**	**0.0**
22. Shaker Heights, Ohio	**0**	**6**	**1**	**0.0**	**0.0**
23. Urbana, Ill.	0	0	2	0.0	0.0
24. Winona, Minn.	**0**	**2**	**2**	**0.0**	**0.0**
25. Hazel Park, Mich.	**0**	**2**	**1**	**0.0**	**0.0**
26. Park Forest, Ill.	0	0	1	0.0	0.0
27. Lackawanna, N.Y.	**0**	**1**	**1**	**0.0**	**0.0**
28. Redwood City, Calif.	**1**	**3**	**6**	**0.3**	**2.6**
29. Yakima, Wash.	**1**	**3**	**2**	**0.4**	**2.3**
30. Wyandotte, Mich.	**1**	**2**	**7**	**0.4**	**2.0**
31. Modesto, Calif.	**1**	**7**	**5**	**0.4**	**3.0**
32. Elkhart, Ind.	**1**	**3**	**5**	**0.5**	**2.6**
33. Hutchinson, Kan.	**1**	**2**	**1**	**0.5**	**2.7**
34. Owensboro, Ky.	**1**	**2**	**2**	**0.5**	**2.3**
35. Danbury, Conn.	**1**	**3**	**5**	**0.5**	**2.4**
36. Champaign, Ill.	**1**	**2**	**3**	**0.5**	**2.1**
37. University City, Mo.	**1**	**4**	**3**	**0.5**	**2.1**
38. Gainesville, Fla.	**1**	**3**	**1**	**0.5**	**3.2**
39. Newburgh, N.Y.	**1**	**2**	**4**	**0.5**	**3.1**
40. Sheboygan, Wis.	1	0	3	0.5	2.1
41. Portsmouth, Ohio	**1**	**3**	**3**	**0.6**	**2.9**
42. Arlington, Mass.	1	1	1	0.6	2.1
43. Elmhurst, Ill.	**1**	**3**	**4**	**0.6**	**2.9**
44. Beloit, Wis.	**1**	**3**	**4**	**0.6**	**3.1**
45. East Cleveland, Ohio	1	1	4	0.6	2.5
46. Mishawaka, Ind.	1	0	5	0.6	2.9
47. Linden, N.J.	**1**	**5**	**4**	**0.6**	**2.7**
48. Rome, Ga.	**1**	**2**	**3**	**0.6**	**3.1**
49. Chicago Heights, Ill.	**1**	**3**	**3**	**0.6**	**3.5**
50. Manhattan Bch., Calif.	1	0	2	0.6	3.1
51. Maywood, Ill.	1	1	1	0.6	3.6
52. Fair Lawn, N.J.	**1**	**2**	**1**	**0.7**	**3.6**
53. Monroe, Mich.	1	0	4	0.7	3.6
54. Fond du Lac, Wis.	**1**	**2**	**1**	**0.7**	**3.0**
55. Oak Park, Mich.	1	0	2	0.7	3.1
56. Lockport, N.Y.	**1**	**3**	**3**	**0.7**	**3.8**
57. Birmingham, Mich.	1	0	3	0.7	3.8
58. Vancouver, Wash.	**2**	**4**	**8**	**0.7**	**4.8**
59. Benton Harbor, Mich.	**1**	**2**	**0**	**0.7**	**3.9**
60. Redlands, Calif.	**1**	**3**	**9**	**0.7**	**3.9**
61. Great Falls, Mont.	2	5	0	0.8	4.3
62. Garfield Heights, Ohio	1	7	4	0.8	2.8
63. Freeport, Ill.	**1**	**3**	**1**	**0.8**	**3.9**
64. Poughkeepsie, N.Y.	2	2	3	0.8	4.9
65. Casper, Wyo.	2	1	1	0.8	3.6
66. Amsterdam, N. Y.	**1**	**3**	**1**	**0.8**	**3.0**
67. Whittier, Calif.	2	2	2	0.8	6.2
68. Lafayette, Ind.	2	1	1	0.9	4.9
69. Annapolis, Md.	**1**	**2**	**1**	**0.9**	**4.0**
70. High Point, N. C.	**2**	**5**	**3**	**0.9**	**4.5**
71. Salina, Kan.	2	1	3	0.9	6.2
72. Eugene, Ore.	**3**	**4**	**3**	**1.0**	**6.5**
73. Hagerstown, Md.	**2**	**4**	**3**	**1.0**	**5.2**
74. Easton, Pa.	2	1	3	1.0	5.0
75. Richmond, Ind.	2	2	0	1.0	4.6
76. Pine Bluff, Ark.	2	2	12	1.0	5.0
77. Wauwatosa, Wis.	2	2	4	1.0	4.3
78. Oshkosh, Wis.	**2**	**5**	**5**	**1.0**	**4.6**
79. Danville, Va.	**2**	**6**	**7**	**1.1**	**4.0**
80. Eau Claire, Wis.	2	2	1	1.1	5.5
81. East Detroit, Mich.	2	0	3	1.1	4.7
82. Rome, N. Y.	2	0	0	1.2	4.2
83. Granite City, Ill.	2	1	3	1.2	5.4
84. Belmont, Mass.	1	0	1	1.2	3.5
85. West Haven, Conn.	2	2	3	1.2	5.4
86. Wausau, Wis.	2	1	0	1.2	6.3
87. Ferndale, Mich.	**2**	**3**	**3**	**1.2**	**5.9**
88. Sandusky, Ohio	**2**	**8**	**6**	**1.2**	**5.7**
89. Janesville, Wis.	**2**	**3**	**1**	**1.2**	**6.3**
90. Groton, Conn.	**1**	**4**	**4**	**1.2**	**3.7**
91. Clearwater, Fla.	**3**	**4**	**7**	**1.2**	**10.3**
92. Norwich, Conn.	2	0	3	1.2	5.1
93. Bloomington, Ill.	2	1	6	1.3	5.5
94. Jackson, Tenn.	2	1	0	1.3	5.9
95. Kankakee, Ill.	2	0	0	1.3	7.0
96. Pasadena, Tex.	**3**	**5**	**2**	**1.3**	**6.3**
97. South Euclid, Ohio	2	0	1	1.3	7.2
98. Billings, Mont.	4	2	1	1.3	10.4
99. Steubenville, Ohio	**2**	**4**	**3**	**1.4**	**5.1**
100. Hackensack, N. J.	2	2	2	1.4	6.2
101. Hamtramck, Mich.	**2**	**3**	**3**	**1.4**	**4.4**
102. Teaneck, N. J.	**2**	**5**	**2**	**1.4**	**5.2**
103. Minot, N. D.	2	0	2	1.5	8.0
104. Zanesville, Ohio	3	3	2	1.5	6.6
105. Enid, Okla.	3	1	1	1.5	8.1
106. Oxnard, Calif.	3	2	1	1.5	8.7
107. Iowa City, Iowa	2	2	0	1.5	7.4
108. Rahway, N. J.	2	1	2	1.5	7.4
109. Aurora, Colo.	3	1	1	1.5	12.0
110. Provo, Utah	2	2	4	1.5	6.1
111. Norman, Okla.	2	2	3	1.5	7.4
112. Pocatello, Idaho	**3**	**7**	**4**	**1.5**	**11.1**
All cities in this group				1.5	7.3
113. Middletown, Conn.	**2**	**4**	**4**	**1.6**	**6.5**
114. St. Louis Park, Minn.	3	0	2	1.6	7.8
115. Burlington, N. C.	2	1	3	1.6	8.0
116. Cheyenne, Wyo.	4	1	2	1.6	9.6
117. Stratford, Conn.	3	3	7	1.7	6.8
118. Marion, Ohio	**3**	**5**	**6**	**1.7**	**7.7**
119. Grand Forks, N. D.	2	0	1	1.7	7.1
120. Lewiston, Maine	2	2	5	1.7	4.9
121. Elgin, Ill.	**4**	**5**	**4**	**1.7**	**8.3**
122. Plainfield, N. J.	4	3	1	1.7	8.5
123. Bloomington, Ind.	3	0	0	1.7	10.0
124. Wilmington, N. C.	4	3	5	1.8	8.8
125. Ontario, Calif.	5	4	4	1.8	12.0
126. Torrington, Conn.	3	3	2	1.8	9.9
127. Palo Alto, Calif.	6	0	3	1.8	12.5
128. West Orange, N. J.	**3**	**5**	**1**	**1.9**	**8.7**
129. Maple Heights, Ohio	2	0	2	1.9	6.9
130. Mountain View, Calif.	**3**	**4**	**5**	**1.9**	**11.5**
131. Highland Park, Ill.	2	1	1	1.9	7.9
132. La Crosse, Wis.	4	4	2	2.0	8.4
133. Port Huron, Mich.	4	2	2	2.0	10.4
134. Findlay, Ohio	3	2	1	2.0	10.4
135. Baldwin Park, Calif.	3	2	5	2.0	9.3
136. Rock Hill, S. C.	3	2	3	2.0	9.0
137. Mason City, Iowa	**3**	**5**	**0**	**2.0**	**10.2**
138. National City, Calif.	**3**	**4**	**2**	**2.1**	**9.4**
139. Tyler, Tex.	6	2	5	2.1	13.2
140. Kokomo, Ind.	5	4	1	2.1	10.9
141. Bangor, Maine	3	3	3	2.1	7.5
142. Allen Park, Mich.	3	3	2	2.1	7.5
143. Odessa, Tex.	6	4	4	2.1	13.5
144. Everett, Wash.	5	4	4	2.1	14.3
145. St. Cloud, Minn.	3	2	1	2.1	9.3
146. Appleton, Wis.	5	1	1	2.3	10.0
147. Fayetteville, N. C.	5	5	5	2.3	11.2
148. Warwick, R. I.	**5**	**6**	**5**	**2.3**	**11.6**
149. Santa Clara, Calif.	**5**	**7**	**8**	**2.3**	**11.5**
150. Burlington, Vt.	3	0	0	2.3	7.8
151. New Kensington, Pa.	3	1	0	2.3	12.0
152. Chicopee, Mass.	4	2	4	2.4	8.1
153. Rapid City, S. D.	5	2	4	2.4	12.5
154. Parkersburg, W. Va.	3	1	1	2.4	9.6
155. Watertown, Mass.	3	0	4	2.4	7.7
156. Concord, N. H.	3	3	0	2.4	10.1
157. Lawton, Okla.	5	3	3	2.5	12.9
158. Moline, Ill.	**5**	**9**	**6**	**2.5**	**12.8**
159. Superior, Wis.	3	1	6	2.5	8.5
160. Monrovia, Calif.	4	1	2	2.6	15.8
161. Oak Ridge, Tenn.	3	2	1	2.7	10.5
162. Denton, Tex.	3	0	0	2.7	11.2
163. Fitchburg, Mass.	4	1	2	2.8	9.3
164. Richfield, Minn.	4	2	1	2.8	11.3
165. Middletown, Ohio	**6**	**7**	**7**	**2.8**	**13.5**
166. Alton, Ill.	5	5	8	2.9	15.3
167. Vineland, N. J.	**5**	**9**	**6**	**2.9**	**15.2**
168. Watertown, N. Y.	4	2	2	2.9	11.2
169. Rock Island, Ill.	6	4	1	2.9	12.1
170. New London, Conn.	4	4	0	3.1	12.8
171. Sumter, S. C.	4	3	0	3.1	15.9
172. Muskogee, Okla.	6	2	4	3.2	16.1
173. Mt. Lebanon, Pa.	3	1	1	3.2	8.7
174. Spartanburg, S. C.	7	2	1	3.3	16.8
175. Coral Gables, Fla.	**6**	**7**	**3**	**3.3**	**20.5**
176. Livonia, Mich.	8	6	9	3.3	16.4
177. Quincy, Ill.	**7**	**8**	**5**	**3.4**	**16.4**
178. Daytona Beach, Fla.	7	4	5	3.4	19.3
179. East Hartford, Conn.	6	4	7	3.6	16.0
180. Beverly Hills, Calif.	8	1	4	3.6	26.3
181. Wallingford, Conn.	4	3	2	3.6	15.2
182. Southfield, Mich.	4	4	5	3.7	15.0
183. Temple, Tex.	5	5	8	3.9	16.6
184. Vallejo, Calif.	11	3	3	3.9	25.0
185. Manchester, Conn.	6	4	10	4.0	15.1
186. Kearny, N. J.	6	2	3	4.2	14.9
187. Hamden, Conn.	5	3	1	4.2	13.1
188. Highland Park, Mich.	9	4	6	4.7	19.4
189. Roseville, Mich.	8	3	7	4.8	19.1
190. Fairfield, Conn.	8	6	4	5.0	19.4
191. Florence, S. C.	7	1	3	5.1	24.6
192. Fremont, Calif.	**5**	**11**	**9**	**5.5**	**18.7**
193. Revere, Mass.	6	3	7	5.5	15.2

Group IX (10,000 to 25,000)

1. Santa Cruz, Calif.	**0**	**4**	**1**	**0.0**	**0.0**
2. Austin, Minn.	**0**	**1**	**0**	**0.0**	**0.0**
3. Edina, Minn.	0	0	2	0.0	0.0
4. Lawrence, Kan.	**0**	**1**	**2**	**0.0**	**0.0**
5. Lodi, Calif.	**0**	**1**	**0**	**0.0**	**0.0**
6. Bartlesville, Okla.	**0**	**4**	**0**	**0.0**	**0.0**
7. Pampa, Tex.	**0**	**2**	**2**	**0.0**	**0.0**
8. Endicott, N. Y.	**0**	**1**	**1**	**0.0**	**0.0**
9. Ames, Iowa	**0**	**1**	**1**	**0.0**	**0.0**
10. Frederick, Md.	0	0	1	0.0	0.0
11. El Cerrito, Calif.	**0**	**1**	**1**	**0.0**	**0.0**
12. Napa, Calif.	**0**	**2**	**11**	**0.0**	**0.0**
13. Covina, Calif.	**0**	**1**	**1**	**0.0**	**0.0**
14. Great Bend, Kan.	**0**	**1**	**0**	**0.0**	**0.0**
15. Corvallis, Ore.	**0**	**1**	**0**	**0.0**	**0.0**
16. Wheaton, Ill.	**0**	**2**	**1**	**0.0**	**0.0**
17. Uniontown, Pa.	**0**	**3**	**1**	**0.0**	**0.0**
18. Richland, Wash.	**0**	**1**	**0**	**0.0**	**0.0**
19. North Platte, Neb.	0	0	0	0.0	0.0
20. Owosso, Mich.	**0**	**1**	**4**	**0.0**	**0.0**
21. Morristown, N. J.	**0**	**4**	**2**	**0.0**	**0.0**
22. Robbinsdale, Minn.	**0**	**3**	**2**	**0.0**	**0.0**
23. Whitefish Bay, Wis.	**0**	**1**	**0**	**0.0**	**0.0**
24. Muscatine, Iowa	**0**	**1**	**2**	**0.0**	**0.0**
25. Traverse City, Mich.	0	0	2	0.0	0.0
26. Floral Park, N. Y.	0	0	0	0.0	0.0
27. Ada, Okla.	0	0	2	0.0	0.0
28. Hibbing, Minn.	0	0	0	0.0	0.0
29. So. Portland, Maine	**0**	**3**	**2**	**0.0**	**0.0**
30. Emporia, Kan.	0	0	0	0.0	0.0
31. Meadville, Pa.	0	0	0	0.0	0.0
32. Coffeyville, Kan.	**0**	**2**	**2**	**0.0**	**0.0**
33. Johnson City, N. Y.	**0**	**1**	**1**	**0.0**	**0.0**
34. Streator, Ill.	0	0	1	0.0	0.0
35. Stillwater, Okla.	**0**	**3**	**1**	**0.0**	**0.0**
36. Las Cruces, N. M.	**0**	**3**	**5**	**0.0**	**0.0**
37. Elmwood Park, Ill.	**0**	**2**	**1**	**0.0**	**0.0**
38. Shorewood, Wis.	**0**	**2**	**1**	**0.0**	**0.0**
39. Pittsburg, Calif.	0	0	1	0.0	0.0
40. Mt. Vernon, Ill.	**0**	**1**	**0**	**0.0**	**0.0**
41. Statesville, N. C.	**0**	**3**	**3**	**0.0**	**0.0**
42. Valparaiso, Ind.	**0**	**1**	**0**	**0.0**	**0.0**
43. Newton, Kan.	**0**	**1**	**0**	**0.0**	**0.0**
44. Evergreen Park, Ill.	**0**	**2**	**2**	**0.0**	**0.0**
45. Antioch, Calif.	**0**	**1**	**1**	**0.0**	**0.0**
46. Villa Park, Ill.	**0**	**1**	**0**	**0.0**	**0.0**
47. Fostoria, Ohio	0	0	1	0.0	0.0
48. La Grange, Ill.	0	0	0	0.0	0.0
49. Defiance, Ohio	0	0	0	0.0	0.0
50. Brookfield, Ill.	**0**	**1**	**1**	**0.0**	**0.0**
51. Livermore, Calif.	**0**	**1**	**2**	**0.0**	**0.0**
52. Santa Paula, Calif.	**0**	**3**	**0**	**0.0**	**0.0**
53. Owatonna, Minn.	0	0	0	0.0	0.0
54. Highland Park, Tex.	**0**	**2**	**0**	**0.0**	**0.0**
55. Wethersfield, Conn.	**0**	**1**	**5**	**0.0**	**0.0**
56. Prescott, Ariz.	**0**	**1**	**2**	**0.0**	**0.0**
57. Wisconsin Rpds., Wis.	0	0	0	0.0	0.0
58. Port Angeles, Wash.	0	0	1	0.0	0.0
59. Garden City, Kan.	0	0	0	0.0	0.0
60. Hanford, Calif.	0	0	0	0.0	0.0
61. Fergus Falls, Minn.	0	0	0	0.0	0.0
62. Kenmore, N. Y.	0	0	2	0.0	0.0
63. Bedford, Ind.	0	0	1	0.0	0.0
64. State College, Pa.	0	0	0	0.0	0.0
65. St. Joseph, Mich.	0	0	0	0.0	0.0
66. Jennings, Mo.	**0**	**1**	**1**	**0.0**	**0.0**
67. Enfield, Conn.	**0**	**1**	**2**	**0.0**	**0.0**
68. Brawley, Calif.	**0**	**2**	**2**	**0.0**	**0.0**
69. Martinsburg, W. Va.	0	0	5	0.0	0.0
70. Galion, Ohio	**0**	**1**	**2**	**0.0**	**0.0**
71. Hays, Kan.	0	0	0	0.0	0.0
72. Menasha, Wis.	**0**	**1**	**0**	**0.0**	**0.0**
73. Plymouth, Mich.	0	0	1	0.0	0.0
74. North Olmsted, Ohio	**0**	**1**	**0**	**0.0**	**0.0**
75. Mt. Pleasant, Mich.	**0**	**1**	**0**	**0.0**	**0.0**
76. Albion, Mich.	**0**	**1**	**1**	**0.0**	**0.0**
77. Van Wert, Ohio	**0**	**2**	**0**	**0.0**	**0.0**
78. Bellefontaine, Ohio	0	0	1	0.0	0.0
79. Suffolk, Va.	0	0	1	0.0	0.0
80. Hornell, N. Y.	0	0	0	0.0	0.0
81. Virginia, Minn.	0	0	1	0.0	0.0
82. Grosse Pt. Wds., Mich.	0	0	2	0.0	0.0
83. Red Wing, Minn.	**0**	**1**	**0**	**0.0**	**0.0**
84. Bay Village, Ohio	**0**	**1**	**0**	**0.0**	**0.0**
85. Circleville, Ohio	0	0	1	0.0	0.0
86. Cudahy, Wis.	**0**	**1**	**4**	**0.0**	**0.0**
87. Pacific Grove, Calif.	0	0	0	0.0	0.0
88. Cambridge, Md.	**0**	**1**	**1**	**0.0**	**0.0**
89. La Grange Park, Ill.	0	0	0	0.0	0.0
90. Fairfield, Calif.	0	0	0	0.0	0.0
91. Windham, Conn.	**0**	**6**	**3**	**0.0**	**0.0**
92. Menominee, Mich.	**0**	**1**	**0**	**0.0**	**0.0**

	Twelve Months 1959	1958	1957	1959 Reg. Rate	1959 Pop. Rate
93. Grosse Pte. Pk., Mich.	0	0	2	0.0	0.0
94. Henderson, N. C.	**0**	**3**	**1**	**0.0**	**0.0**
95. Covington, Va.	0	0	0	0.0	0.0
96. Ecorse, Mich.	0	0	2	0.0	0.0
97. Ironwood, Mich.	0	0	1	0.0	0.0
98. Maumee, Ohio	0	0	1	0.0	0.0
99. Fort Thomas, Ky.	**0**	**1**	**2**	**0.0**	**0.0**
100. Moscow, Idaho	0	0	0	0.0	0.0
101. Bellaire, Ohio	**0**	**1**	**1**	**0.0**	**0.0**
102. Ridgefield Park, N. J.	0	0	3	0.0	0.0
103. Derby, Conn.	**0**	**1**	**1**	**0.0**	**0.0**
104. La Salle, Ill.	0	0	1	0.0	0.0
105. Webster, Mass.	0	0	0	0.0	0.0
106. Beacon, N. Y.	**0**	**2**	**2**	**0.0**	**0.0**
107. Ashland, Wis.	**0**	**1**	**0**	**0.0**	**0.0**
108. Fairfield, Ala.	0	0	0	0.0	0.0
109. Amherst, Mass.	**0**	**2**	**0**	**0.0**	**0.0**
110. Donora, Pa.	0	0	0	0.0	0.0
111. Rolling Meadows, Ill.	0	0	0	0.0	0.0
112. Englewood, Colo.	1	1	0	0.6	4.4
113. Greeley, Colo.	**1**	**2**	**4**	**0.6**	**4.1**
114. Fort Myers, Fla.	1	1	0	0.7	5.6
115. Ponca City, Okla.	**1**	**0**	**3**	**0.7**	**4.3**
116. Orange, Calif.	**1**	**3**	**4**	**0.7**	**4.7**
117. Port Chester, N. Y.	1	1	0	0.7	4.0
118. La Porte, Ind.	**1**	**3**	**3**	**0.8**	**4.3**
119. Klamath Falls, Ore.	1	0	4	0.8	5.3
120. Bell, Calif.	1	0	1	0.8	5.4
121. Sherman, Tex.	1	1	4	0.8	4.5
122. Kingsport, Tenn.	1	0	0	0.9	4.1
123. Manhattan, Kan.	1	0	2	0.9	5.2
124. Renton, Wash.	1	1	1	0.9	5.9
125. Fremont, Ohio	1	0	2	0.9	5.2
126. Aberdeen, S. D.	**1**	**2**	**2**	**0.9**	**4.5**
127. Monterey, Calif.	1	1	3	0.9	4.6
128. Cranford, N. J.	1	0	1	1.0	4.4
129. Pittsburg, Kan.	1	0	1	1.0	4.8
130. So. St. Paul, Minn.	1	1	1	1.0	5.8
131. Yuma, Ariz.	1	0	2	1.0	7.9
132. Cape Girardeau, Mo.	1	0	1	1.0	4.5
133. Marietta, Ohio	1	1	1	1.0	5.7
134. Chico, Calif.	**1**	**3**	**0**	**1.1**	**8.0**
135. Xenia, Ohio	**1**	**2**	**2**	**1.1**	**6.0**
136. Connersville, Ind.	**1**	**2**	**0**	**1.1**	**5.6**
137. Ashland, Ohio	1	1	2	1.1	6.1
138. Greensburg, Pa.	1	0	1	1.1	5.7
139. New Bern, N. C.	**1**	**3**	**3**	**1.1**	**5.3**
140. Brainerd, Minn.	1	1	1	1.2	7.9
141. Sterling, Ill.	1	1	0	1.2	6.6
142. Greenwood, Miss.	1	0	1	1.2	5.2
143. Pasco, Wash.	1	1	1	1.2	7.1
144. Takoma Park, Md.	1	0	1	1.2	6.5
145. Massena, N. Y.	**1**	**2**	**2**	**1.2**	**6.1**
146. Goshen, Ind.	1	1	0	1.3	7.6
147. Bristol, Va.	1	1	0	1.3	5.6
148. Salinas, Calif.	**2**	**5**	**3**	**1.3**	**9.5**
149. Pompano Beach, Fla.	1	0	3	1.3	8.3
150. Rocky River, Ohio	1	1	1	1.3	6.4
151. Glenview, Ill.	1	1	1	1.3	6.8
152. Grand Island, Neb.	2	2	1	1.3	8.0
153. Vernon, Conn.	**1**	**2**	**1**	**1.3**	**6.0**
154. Logan, Utah	**1**	**3**	**0**	**1.4**	**6.0**
155. Winfield, Kan.	1	1	0	1.4	9.5
156. Branford, Conn.	1	0	1	1.4	6.9
157. Watertown, Wis.	1	1	5	1.4	7.7
158. Rye, N. Y.	1	1	3	1.4	7.2
159. Waynesboro, Va.	1	1	3	1.4	6.8
160. Griffin, Ga.	1	0	0	1.4	7.1
161. Ansonia, Conn.	1	0	3	1.4	5.1
162. Albany, Calif.	1	1	3	1.4	5.7
163. Lamesa, Tex.	1	0	1	1.5	9.3
164. Escanaba, Mich.	1	0	2	1.5	6.6
165. Atchison, Kan.	1	1	0	1.5	7.8
166. Gardner, Mass.	**1**	**2**	**0**	**1.5**	**5.0**
167. Beaver Dam, Wis.	1	0	1	1.5	8.3
168. Conneaut, Ohio	1	0	2	1.5	8.4
169. Winnetka, Ill.	1	1	2	1.5	7.5
170. Bismarck, N. D.	2	1	0	1.6	9.0
171. Lake Worth, Fla.	**2**	**3**	**9**	**1.6**	**13.1**
172. Elizabeth City, N. C.	1	1	1	1.6	7.9
173. Butler, Pa.	2	1	3	1.6	8.2
174. Southington, Conn.	1	3	5	1.6	5.9
175. Bowling Green, Ohio	1	1	1	1.6	6.8
176. Ypsilanti, Mich.	2	1	2	1.6	8.7
177. Central Falls, R. I.	1	0	0	1.6	4.2
All cities in this group				1.6	8.1
178. Ocala, Fla.	**2**	**4**	**3**	**1.7**	**14.0**
179. Dover, Ohio	**1**	**3**	**3**	**1.7**	**9.3**
180. Winchester, Conn.	**1**	**3**	**1**	**1.7**	**8.4**
181. North Miami, Fla.	2	0	1	1.7	8.5
182. Reidsville, N. C.	1	0	2	1.7	8.5
183. Homewood, Ala.	**1**	**2**	**2**	**1.8**	**5.6**
184. East Haven, Conn.	2	1	1	1.8	10.6
185. Cadillac, Mich.	1	0	0	1.8	9.6
186. University Hts., Ohio	1	1	0	1.8	6.2
187. Charles City, Iowa	1	1	1	1.8	9.7
188. Tiffin, Ohio	2	1	1	1.8	8.5
189. Two Rivers, Wis.	1	0	0	1.8	8.7
190. Wilmette, Ill.	2	2	1	1.9	8.1
191. Ottawa, Ill.	2	2	2	1.9	10.3
192. Jeffersonville, Ind.	2	1	1	1.9	10.0
193. Madison Hts., Mich.	2	1	0	1.9	9.4
194. Wayne, Mich.	2	2	1	1.9	10.0
195. Denison, Tex.	**2**	**3**	**1**	**1.9**	**9.6**
196. Stoughton, Mass.	**1**	**4**	**2**	**1.9**	**7.2**
197. Milford, Mass.	1	1	1	1.9	6.4
198. Westlake, Ohio	1	1	3	1.9	9.3
199. Salisbury, N. C.	2	1	5	1.9	9.5
200. Auburn, Mass.	1	1	3	2.0	8.1
201. Texarkana, Ark.	**2**	**2**	**2**	**2.0**	**10.2**
202. Colton, Calif.	**2**	**4**	**3**	**2.0**	**10.6**
203. Cedar Falls, Iowa	2	0	1	2.0	11.2
204. Niles, Mich.	2	1	3	2.1	11.0
205. Victoria, Tex.	3	0	4	2.1	13.4
206. Hollywood, Fla.	4	1	3	2.1	17.5
207. Los Altos, Calif.	3	0	5	2.1	15.4
208. Berkley, Mich.	2	1	5	2.2	8.7
209. Moorhead, Minn.	2	2	0	2.2	11.2
210. Longview, Wash.	3	3	2	2.2	12.9
211. Leominster, Mass.	2	2	2	2.2	8.1
212. Waukesha, Wis.	3	0	0	2.2	12.4
213. So. Milwaukee, Wis.	2	0	4	2.3	12.8
214. Tempe, Ariz.	2	0	2	2.3	16.0

TRAFFIC DEATHS—STATE RECORDS

Deaths are reported by state traffic authorities.

All figures are preliminary. To insure proper comparisons, 1958 and 1957 figures cover the same reporting period as those for 1959.

Population Rate: U. S. population rate is the estimated annual number of deaths per 100,000 population, assuming that deaths for the rest of the year will follow the normal seasonal pattern. State population rate is the estimated annual number of deaths per 100,000 population, assuming that the monthly average of deaths will remain at the present average for the rest of the year. Population rates are based on July 1, 1959, population estimates, U. S. Bureau of the Census, Washington, D. C.

States shown in heavy type have improved in 1959 compared with 1958, or showed no change.

Mileage Rate: The number of deaths per 100 million vehicle miles of travel.

(Figures in parentheses following the 1959 mileage rate indicate the number of months for which the mileage rate is calculated for each state.)

	Months Reported	Deaths Identical Periods 1959	1958	1957	% Change 1958 to 1959	% Change 1957 to 1959	1959 Pop. Rate	1959 Mile. Rate	
TOTAL U.S.	12	37,800	37,000	38,702	+ 2%	— 2%	21.4	5.4	(12)
Ala.	**12**	**821**	**831**	**910**	**— 1%**	**— 10%**	**25.7**	**6.7**	**(10)**
Alaska	12	34	31	—	+ 10%	—	17.8	—	—
Ariz.	12	514	506	460	+ 2%	+ 12%	41.7	8.2	(11)
Ark.	12	458	444	493	+ 3%	— 7%	26.3	6.6	(11)
Calif.	12	3,585	3,502	3,653	+ 2%	— 2%	24.5	5.1	(10)
Colo.	12	401	395	367	+ 2%	+ 9%	23.8	5.3	(9)
Conn.	**12**	**248**	**251**	**284**	**— 1%**	**— 13%**	**10.3**	**2.5**	**(11)**
Del.	**12**	**82**	**83**	**91**	**— 1%**	**— 10%**	**18.1**	**4.0**	**(11)**
D. of C.	**12**	**61**	**62**	**69**	**— 2%**	**— 12%**	**7.3**	**2.3**	**(9)**
Fla.	**12**	**1,098**	**1,116**	**1,060**	**— 2%**	**+ 4%**	**23.1**	**5.4**	**(11)**
Ga.	12	978	942	988	+ 4%	— 1%	25.5	6.1	(11)
Idaho	**12**	**222**	**270**	**203**	**— 18%**	**+ 9%**	**33.4**	**6.8**	**(10)**
Ill.	**12**	**1,765**	**1,875**	**2,096**	**— 6%**	**— 16%**	**17.3**	**4.6**	**(9)**
Ind.	12	1,119	1,048	1,161	+ 7%	— 4%	24.1	5.2	(11)
Ia.	12	678	598	689	+ 13%	— 2%	24.1	5.5	(10)
Kan.	12	565	552	579	+ 2%	— 2%	26.4	5.8	(10)
Ky.	**12**	**739**	**785**	**783**	**— 6%**	**— 6%**	**23.6**	**6.7**	**(10)**
La.	**12**	**682**	**765**	**817**	**— 11%**	**— 17%**	**21.5**	**5.9**	**(11)**
Maine	**12**	**136**	**204**	**153**	**— 33%**	**— 11%**	**14.3**	**3.4**	**(11)**
Md.	12	521	502	550	+ 4%	— 5%	17.2	4.9	(10)
Mass.	**12**	**557**	**587**	**517**	**— 5%**	**+ 8%**	**11.3**	**3.1**	**(10)**
Mich.	12	1,440	1,334	1,511	+ 8%	— 5%	18.1	4.6	(11)
Minn.	**12**	**656**	**703**	**685**	**— 7%**	**— 4%**	**19.3**	**4.6**	**(11)**
Miss.	12	549	547	522	+ *%	+ 5%	25.1	6.7	(11)
Mo.	12	982	967	993	+ 2%	— 1%	23.1	5.1	(10)
Mont.	12	244	193	210	+ 26%	+ 16%	35.5	6.7	(10)
Neb.	**12**	**340**	**344**	**301**	**— 1%**	**+ 13%**	**23.4**	**4.9**	**(11)**
Nev.	12	180	142	139	+ 27%	+ 29%	64.3	9.6	(9)
N. H.	12	122	100	92	+ 22%	+ 33%	20.6	5.0	(11)
N. J.	12	762	754	833	+ 1%	— 9%	12.8	3.1	(11)
N. M.	12	454	406	427	+ 12%	+ 6%	51.6	8.6	(10)
N. Y.	11	1,986	1,895	1,947	+ 5%	+ 2%	13.3	4.6	(10)
N. C.	12	1,186	1,078	1,059	+ 10%	+ 12%	26.2	6.5	(10)
N. D.	12	163	154	147	+ 6%	+ 11%	25.4	7.8	(10)
Ohio	12	1,834	1,812	2,036	+ 1%	— 10%	18.9	4.4	(9)
Okla.	**12**	**639**	**662**	**701**	**— 3%**	**— 9%**	**28.1**	**5.7**	**(10)**
Ore.	12	487	437	464	+ 11%	+ 5%	27.6	5.6	(10)
Pa.	12	1,685	1,654	1,698	+ 2%	— 1%	14.9	4.1	(10)
R. I.	11	82	67	69	+ 22%	+ 19%	10.3	2.7	(10)
S. C.	12	678	610	715	+ 11%	— 5%	28.1	7.3	(10)
S. D.	**12**	**222**	**239**	**175**	**— 7%**	**+ 27%**	**32.3**	**5.6**	**(11)**
Tenn.	12	770	718	695	+ 7%	+ 11%	22.0	5.3	(10)
Tex.	12	2,439	2,296	2,501	+ 6%	— 2%	25.6	5.1	(10)
Utah	12	204	190	222	+ 7%	— 8%	23.2	4.7	(9)
Vt.	12	89	77	106	+ 16%	— 16%	23.9	5.5	(11)
Va.	**12**	**848**	**853**	**907**	**— 1%**	**— 7%**	**21.2**	**5.1**	**(11)**
Wash.	**12**	**547**	**569**	**545**	**— 4%**	**+ *%**	**19.4**	**4.4**	**(9)**
W. Va.	12	398	387	478	+ 3%	— 17%	20.3	6.9	(11)
Wis.	**12**	**821**	**822**	**917**	**— *%**	**— 10%**	**20.5**	**5.4**	**(10)**
Wyo.	12	169	137	157	+ 23%	+ 8%	53.0	8.2	(10)
Hawaii	12	95	—	—	—	—	14.5	—	—
P. R.‡	**12**	**269**	**298**	**238**	**— 10%**	**+ 13%**	**11.6**	**11.5**	**(10)**
V. I.†	**12**	**7**	**7**	**—**	**0%**	**—**	**25.9**	**—**	**—**
CANADIAN PROVINCES									
Alta.	**11**	**236**	**275**	**232**	**— 14%**	**+ 2%**	**22.2**	**—**	**—**
B. C.	10	262	218	190	+ 20%	+ 38%	21.1	—	—
Man.	11	133	111	122	+ 20%	+ 9%	16.9	—	—
Sask.	11	155	128	120	+ 21%	+ 29%	19.2	—	—

*Less than .5%
‡Comonwealth of Puerto Rico
†Virgin Islands

	Twelve Months 1959	1958	1957	1959 Reg. Rate	1959 Pop. Rate
215. El Dorado, Kan.	2	0	3	2.3	16.9
216. Carlsbad, N. M.	3	1	2	2.3	15.2
217. Arkansas City, Kan.	2	0	1	2.3	14.2
218. Pendleton, Ore.	2	0	0	2.3	13.2
219. Marquette, Mich.	2	0	2	2.4	10.7
220. Collingswood, N. J.	2	2	2	2.4	11.1
221. Corona, Calif.	2	2	2	2.4	15.7
222. Stevens Point, Wis.	2	0	1	2.4	11.4
223. Bloomington, Minn.	**2**	**6**	**1**	**2.5**	**15.9**
224. Watertown, Conn.	1	0	1	2.5	7.5
225. East Moline, Ill.	2	1	2	2.5	13.1
226. Faribault, Minn.	2	1	0	2.6	12.4
227. Yuba City, Calif.	2	2	1	2.6	19.4
228. The Dalles, Ore.	2	0	1	2.6	17.7
229. Shelton, Conn.	**2**	**5**	**1**	**2.7**	**12.0**
230. Boone, Iowa	2	0	1	2.7	16.4
231. Sault Ste. Marie, Mich.	2	2	3	2.7	10.2
232. North Adams, Mass.	2	0	1	2.7	9.3
233. South Orange, N. J.	2	2	0	2.7	12.3
234. Astoria, Ore.	2	1	2	2.7	16.3
235. Hawthorne, N. J.	2	0	3	2.8	12.6
236. Merced, Calif.	4	3	3	2.8	19.6
237. Marshfield, Wis.	**2**	**4**	**0**	**2.9**	**14.7**
238. Mesa, Ariz.	5	1	3	2.9	22.9
239. Holland, Mich.	3	2	3	2.9	15.4
240. Brownwood, Tex.	3	2	0	2.9	14.9
241. Westport, Conn.	3	2	2	2.9	17.6
242. Canton, Ill.	2	0	0	3.0	16.8
243. Oceanside, Calif.	**3**	**6**	**8**	**3.0**	**14.6**
244. Mitchell, S. D.	2	0	0	3.0	16.5
245. Hopewell, Va.	2	1	1	3.1	10.5
246. La Mesa, Calif.	5	1	2	3.1	21.3
247. Wooster, Ohio	3	1	1	3.2	17.6
248. Augusta, Maine	**3**	**6**	**1**	**3.2**	**12.1**
249. Windsor, Conn.	**2**	**6**	**2**	**3.4**	**12.0**
250. Du Bois, Pa.	2	0	0	3.4	17.4
251. Caldwell, Idaho	3	1	1	3.4	25.6
252. Marinette, Wis.	2	1	1	3.4	14.1
253. Peru, Ind.	3	0	0	3.5	19.9
254. Woodland, Calif.	3	0	1	3.5	25.9
255. Garland, Tex.	5	1	3	3.5	22.4
256. Kinston, N. C.	4	1	0	3.6	17.7
257. Bemidji, Minn.	2	1	1	3.7	20.0
258. North Chicago, Ill.	**2**	**3**	**2**	**3.8**	**11.1**
259. Los Alamos, N. M.	2	0	1	3.8	14.9
260. Monroe, N. C.	2	1	1	3.9	19.0
261. Mansfield, Conn.	2	0	1	3.9	17.2
262. Needham, Mass.	3	3	3	4.0	13.9
263. Stonington, Conn.	2	1	2	4.1	12.2
264. Mamaroneck, N. Y.	3	0	0	4.2	17.6
265. Borger, Tex.	5	2	2	4.7	27.6
266. Muskegon Hts., Mich.	5	0	2	4.9	21.6
267. Killingly, Conn.	2	0	4	5.0	16.9
268. Darien, Conn.	4	0	6	5.1	25.5
269. Albert Lea, Minn.	5	0	3	5.2	37.0
270. River Rouge, Mich.	3	1	0	5.2	14.1
271. Middleborough, Mass.	**3**	**8**	**2**	**5.3**	**27.0**
272. W. Springfield, Mass.	6	6	2	5.5	26.2
273. Dyersburg, Tenn.	3	1	2	5.6	27.5
274. Goldsboro, N. C.	6	2	6	5.7	27.9
275. Kennewick, Wash.	5	0	3	5.7	36.5
276. Plainview, Tex.	6	0	0	5.8	37.0
277. West Lafayette, Ind.	3	1	0	5.8	22.9
278. Newport Beach, Calif.	6	5	2	5.9	28.3
279. Niles, Ohio	5	0	1	6.1	25.6
280. Alpena, Mich.	5	1	2	6.2	32.7
281. Naugatuck, Conn.	5	0	2	6.4	25.5
282. Attleboro, Mass.	5	3	0	6.4	20.1
283. Norfolk, Neb.	5	1	0	6.5	39.4
284. Martinsville, Va.	6	0	1	6.6	31.6
285. River Forest, Ill.	4	0	2	6.9	37.0
286. Calumet City, Ill.	**7**	**8**	**7**	**7.5**	**31.1**
287. Westminster, Calif.	9	1	0	12.1	56.3
288. Huntington Bch., Cal.	12	3	8	22.4	120.0
CANADIAN CITIES					
Toronto, Ont.	102	123	119	—	6.9
Hamilton, Ont.	17	21	25	—	7.0
Vancouver, B. C.	29	36	36	—	7.2
London, Ont.	11	6	13	—	10.8
Montreal, Que.	133	116	147	—	12.0

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MOTOR VEHICLE DEATHS AND INJURIES BY STATES 1959 and 1958

Forty-five states and the District of Columbia have reported their death and injury experience for six to eleven months of 1959.

The table below shows all of the injury data reported by each state, but little information is available on precisely what injuries are included in each state's tabulation.

Differences in the ratio of injuries to deaths probably reflect primarily differences in the extent to which all injuries are reported. Other factors are undoubtedly involved, such as: (1) a few states omit some or all of the injuries in urban accidents; (2) there are large differences between states in the proportion of travel which is in urban area (the injury-death ratio for urban accidents is about four times the ratio for rural accidents).

The question of what injuries are being reported applies with equal force to the per cent change in injuries from 1958 to 1959. Any tightening up of police administration, any emphasis on "get all the injuries" is almost certain to bring about an increase in reported injuries, but probably only in minor ones. Similarly, instructions to "skip the scratches" probably would result in a decrease in recorded cases in many states. Introduction of financial responsibility laws has been observed to increase reported injuries sharply. Even the public's increased claims-consciousness is regarded by many people as an element in the growing number of injuries reported. With such factors operating to destroy comparability, indicated changes in the number of injuries should not be considered as reliable.

Months Reported	Deaths†† 1959	1958	Injuries†† 1959	1958	% Change 1958 to 1959 Deaths	Injuries	1959 Ratio of Injuries to Deaths
TOTAL U.S. **	27,982#	27,284#	1,162,203	1,099,062	+ 3#	+ 6	42
Ala. 11	734	743	4,426†	4,436†	— 1	— *	6
Ariz. 7	320	270	5,942	5,045	+ 19	+ 18	19
Ark. 11	426	400	3,313	3,192	+ 7	+ 4	8
Calif. 10	2,864	2,861	116,816	110,915	+ *	+ 5	41
Colo. 8	265	242	9,019	7,818	+ 10	+ 15	34
Conn. 9	170	165	14,817	15,662	+ 3	— 5	87
Del. 11	77	79	2,568	2,205	— 3	+ 16	33
D. of C. 11	55	55	7,313	6,483	0	+ 13	133
Fla. 11	978	1,000	36,079	29,442	— 2	+ 23	37
Ga. 11	891	826	15,609	13,968	+ 8	+ 12	18
Idaho 9	167	201	4,067	3,761	— 17	+ 8	24
Ill. 9	1,252	1,279	73,973	71,724	— 2	+ 3	59
Ind. 9	791	727	26,667	26,532	+ 9	+ 1	34
Iowa 6	307	256	8,595	8,825	+ 20	— 3	28
Kan. 10	472	458	13,029	12,745	+ 3	+ 2	28
Ky. 11	673	696	14,343	13,758	— 3	+ 4	21
La. 11	599	699	8,016†	7,537†	— 14	+ 6	13
Maine 11	127	178	6,081	6,242	— 29	— 3	48
Md. 9	397	366	15,372	13,794	+ 8	+ 11	39
Mass. 7	293	320	51,591	51,044	— 8	+ 1	176
Mich. 11	1,288	1,197	56,820	49,919	+ 8	+ 14	44
Minn. 11	581	645	25,643	23,503	— 10	+ 9	44
Miss. 7	298	265	4,052	3,756	+ 12	+ 8	14
Mo. 11	890	856	11,235	10,586	+ 4	+ 6	13
Mont. 9	177	144	2,257	2,004	+ 23	+ 13	13
Neb. 10	285	279	8,832	7,940	+ 2	+ 11	31
Nev.							
N. H. 11	111	89	5,559	5,193	+ 25	+ 7	50
N. J. 9	539	533	48,879	43,289	+ 1	+ 13	91
N. M. 10	377	328	4,548	4,440	+ 15	+ 2	12
N. Y. 10	1,769	1,683	224,459	221,167	+ 5	+ 1	127
N. C. 9	848	737	17,679	14,991	+ 15	+ 18	21
N. D. 7	94	85	1,614	1,528	+ 11	+ 6	17
Ohio 11	1,651	1,630	70,409	68,734	+ 1	+ 2	43
Okla. 11	576	614	14,483	13,327	— 6	+ 9	25
Ore. 11	427	400	17,635	14,815	+ 7	+ 19	41
Pa. 8	1,005	1,032	55,778	58,622	— 3	— 5	56
R. I. 7	47	41	5,078	4,766	+ 15	+ 7	108
S. C. 11	597	542	9,223	9,235	+ 10	— *	15
S. D.							
Tenn. 10	608	588	14,017	12,101	+ 3	+ 16	23
Tex. 11	2,192	2,059	66,520	58,538	+ 6	+ 14	30
Utah 8	124	128	3,865	3,634	— 3	+ 6	31
Vt. 11	79	73	2,983	2,609	+ 8	+ 14	38
Va. 10	684	683	21,329	19,579	+ *	+ 9	31
Wash. 10	430	449	23,952	22,434	— 4	+ 7	56
W. Va. 9	301	264	5,830	5,306	+ 14	+ 10	19
Wis.							
Wyo. 10	146	119	1,888	1,918	+ 23	— 2	13
P. R.‡ 10	204	242	9,818	8,337	— 15	+ 18	48
V. I.¶ 10	6	4	160	169	+ 50	— 5	27

†Rural injuries only.

††All figures are preliminary. To insure proper comparisons, 1958 figures cover the same reporting period as those for 1959.

*Less than .5%

**Death and injury totals cover reports for all months indicated in this column.

#Death totals and changes differ from national figures because those shown here are based on the states and months for which injury data are reported.

‡Commonwealth of Puerto Rico.

¶Virgin Islands.

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By Lois Zearing, Librarian, NSC

Accidents

Accident Experience. *Comparing Expressways and Arterials.* 1959. 63pp. Chicago Area Transportation Study, 4812 West Madison Street, Chicago 44, Ill.

(This study contrasts and compares accident experience on city arterial streets and on expressways in an attempt to measure the amount of accident reduction expressways bring about.)

A Motor Cycle Accident Study. S. Breshewel and P. M. Barnes. 31 pp. National Institute for Personnel Research, P. O. Box 10319, Johannesburgh, Union of South Africa.

(A detailed analysis of motor-cycle accidents covering the years 1946-1956 inclusive. Data quoted served to show that since the last war there was a great increase in the number of motor-cycle accidents and that the fatality rate per thousand registered motor-cycles is higher in the Union than in the 12 countries of the Commonwealth of Europe.)

Traffic Accidents on Interstate Highways. W. B. Shelton. *Virginia Highway Bulletin,* November, 1959, p. 1-3, 35.

Automobiles

Safety: An Expert Takes a Critical Look at the '60 Cars. Paul W. Kearney. *Popular Science,* January, 1960, p. 119-121, 245.

(Ingenious new safety features show up in the new crop, but far too many needless hazards remain.)

STOP ACCIDENTS CAMPAIGN

When a driver lets his temper take over he puts himself and others in danger. That is one of the bad attitudes stressed in the current Stop Accidents Campaign conducted by The Advertising Council in cooperation with the National Safety Council.

Newspaper ads, like the one here, show how attitudes—a fight with a boss, a desire to "get even" with another, a domestic squabble—can produce inattention or recklessness and invite death and destruction on the highway.

The campaign theme is based on studies of psychologists and on mounting evidence that explains why average, decent people who wouldn't think of hurting another human being nevertheless smash up on highways.

"If Jane had only stopped telling me how to drive . . ."
When anger grips the wheel, safety slips away! If a backseat driver raises your temper to the boiling point, hold on! Showing your critic just who's running things can be dangerous. 37,000 people died on our highways last year. Many were victims of drivers who, in one thoughtless moment, allowed their emotions to take over. So keep your head . . . losing it could cost you your life!
Where traffic laws are obeyed and enforced, deaths go DOWN!

Published in an effort to save lives, in cooperation with the National Safety Council and The Advertising Council.

Commercial Vehicles

Why Safety Programs Go Wrong. Ed Deem. *Commercial Car Journal,* December, 1959, p. 108-109.

(A veteran driver makes four specific suggestions on how to get driver acceptance and cooperation with a fleet safety program.)

Drivers and Driving

Driver Attitudes. Amos E. Neyhart. *Police,* November-December, 1959, p. 31-33.

(Lists characteristics of accident repeaters and specific attitudes of good drivers.)

Effects of Chlorpromazine and Alcohol on Coordination and Judgment. George A. Zirkle and others. *Journal of the American Medical Association,* Nov. 14, 1959, p. 168/1496—171/1499.

(This study was designed to test the belief that simultaneous use of tranquilizing drugs and alcoholic drinks has a particularly bad effect on neuromuscular coordination and interferes with safety in automobile driving.)

Ways and Means, Other Than Propaganda and Police Controls, of Improving Driving Habits and Driver Behaviour. Eric Legrand. *International Road Safety and Traffic Review,* Autumn 1959, p. 18-20, 22, 36.

(The author thinks greater importance should be attached to methods of training the driver. He believes there is a special technique applicable to learning how to drive.)

Enforcement

National Standards for Improving the Administration of Justice in Traffic Courts. 13 pp. Standing Committee on Traffic Court Program, American Bar Association, 1155 East 60th St., Chicago 37, Ill.

(Prepared for the conference "The Law and the Layman" August 24-25, 1959, Miami Beach, Fla.)

Engineering

An Inventory of Traffic Engineering Activities in California Cities—1959. Wolfgang S. Hamburger and Bob Glenn. 1959. 6pp. The Institute of Transportation and Traffic Engineering, University of California, Berkeley, Calif. (Special Report).

(Data obtained from survey of general interest.)

Highway Safety—A Primary Challenge to Traffic Engineering. Charles W. Prisk. *Traffic Engineering,* November, 1959, p. 11-12, 42, 54.

(Matson Award Paper presented in 1959 at the 29th Annual Meeting of the Institute of Traffic Engineers.)

Highways

Curses on Construction. Burton W. Marsh. *American Road Builder*, September, 1959, p. 10.

(Gives steps which contractors should consider to provide safety for motorists when highway is under construction.)

Expressway Center Barriers Studied, Design Sought to Trap Wayward Cars. *Cook County Highways*, November, 1959, p. 4-5, 7.

(California impact tests studied by Cook County Highway Department. Chain fence found best median barrier.)

Toughest Turnpike Winter Maintenance Job. *Roads and Streets*, November, 1959, p. 98-99, 106-107, 114-115, 161.

(Maintenance of the New York State Thruway during winter months giving a list of equipment used.)

Insurance

Safe Driver Insurance. James M. Cahill. *Best's Fire and Casualty News*, November, 1959, p. 21-26, 66-70.

(A plan based upon the theory that past convictions for moving traffic violations provide an index of chance of involvement in an automobile accident in the future.)

Parking

Traffic Controls in Parking Ramps. Peter D. Schwarz. *Traffic Engineering*, November, 1959, p. 13-14, 56.

Regulations

An Explanation of the 1959 *Illinois School Speed Limit Law*. 18pp. October, 1959. Legislative Bureau, Chicago Motor Club, 66 E. South Water St., Chicago, Ill. (Distributed upon request without cost by the Chicago Motor Club.)

Signs and Signals

Modern Traffic Signal Practice. George W. Howie, *The American City*, December, 1959, p. 137-139.

(Changes suggested for the Manual on Uniform Traffic Control Devices for Streets and Highways.)

Signing the Interstate. D. O. Opstad. *American Road Builder*, October, 1959, p. 8-9.

(Importance of uniformity on Interstate highways.)

Speed

Highway Speed Study. 1959. Prepared by Traffic Division, Bureau of Traffic-Planning-Design, State Highway Department, Hartford, Conn.

(The twelfth year of quarterly or seasonal observations of vehicular speeds as recorded by the radar meter under favorable driving conditions at 13 stations in Connecticut.)

Realistic Speed Limits. Dwight R. G. Palmer, *American Road Builder*, October, 1959, p. 11-12.

(New Jersey officials do not feel slow speeds are necessarily safe speeds so they study the entire route and assign speed limits based on maximum speeds ascertained for different sections of the highway.)

ADDRESSES OF MAGAZINES MENTIONED

The American City
470 Fourth Ave.
New York 16, N. Y.

The American Road Builder
World Center Bldg.
918 16th St., N.W.
Washington 6, D. C.

Best's Fire and Casualty News
75 Fulton St.
New York 38, N. Y.

Commercial Car Journal
Chestnut & 56th Sts.
Philadelphia, Pa.

Cook County Highways
130 N. Wells St.
Chicago 6, Ill.

International Road Safety and Traffic Review
32, Chesham Place
London, S.W. 1, England

Journal of the American Medical Assn.
535 N. Dearborn St.
Chicago 10, Ill.

Police
301-327 E. Lawrence Ave.
Springfield, Ill.

Popular Science Monthly
353 Fourth Ave.
New York 10, N. Y.

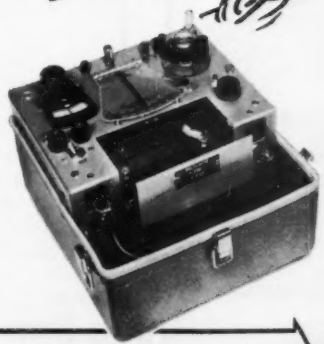
Roads and Streets
22 W. Maple St.
Chicago 10, Ill.

Traffic Engineering
2029 K Street, N.W.
Washington 6, D. C.

Virginia Highway Bulletin
Virginia Department of Highways
Richmond, Va.

The BORKENSTEIN BREATHALYZER

"strengthens the hand of the LAW!"



Scofflaws, or their attorneys, cannot flout the testimony of the BORKENSTEIN BREATHALYZER. This instrument is quick, accurate and foolproof, providing a permanent, unalterable record—with fingerprint—for documentary evidence in court. It is an infallible means of conviction—or exoneration—in suspected "under-the-influence" cases.

The BREATHALYZER was designed by an internationally known authority on chemical breath testing, Professor Robert F. Borkenstein, Chairman of the Department of Police Administration, Indiana University—formerly Director of the Indiana State Police Laboratory.

The unit is easy and inexpensive to operate, requires little maintenance, and its simple principle and design are readily understood when explained in a court room.

Send coupon for information or free demonstration.

STEPHENSON CORPORATION
RED BANK NEW JERSEY

STEPHENSON CORPORATION, Red Bank, New Jersey
☐ Please send me Bulletin "J-24"
☐ Please arrange for demonstration
NAME_____
TITLE_____
STREET_____
CITY_____ STATE_____

Circle Item No. 5—Reader Service Card

A Motorist's Prayer

Our Heavenly Father, we ask this day a particular blessing as we take the wheel of our car. Grant us safe passage through all the perils of travel; shelter those who accompany us and protect us from harm by Thy mercy; steady our hands and quicken our eye that we may never take another's life; guide us to our destination safely, confident in the knowledge that Thy blessings go with us through darkness and light . . . sunshine and shower . . . forever and ever.

Amen.

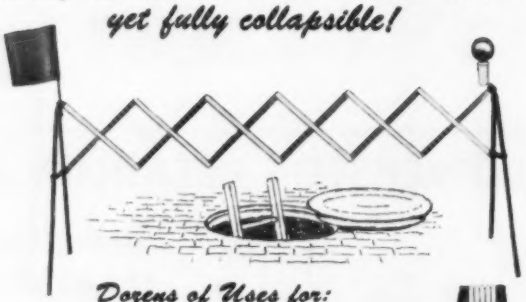
(State Highway Patrol
North Carolina Department
of Motor Vehicles)

Circle Item No. 6—Reader Service Card

GUARD-GATE
PATENTED

ALL-STEEL
SAFETY BARRICADE

Ready for instant service in seconds . . .
yet fully collapsible!



Dozens of Uses for:
PUBLIC UTILITIES — INDUSTRIAL PLANTS
CONTRACTORS AND SERVICE UNITS — POLICE,
FIRE AND HIGHWAY DEPTS.

GUARD-GATE is made of reinforced steel — built to last. Comes complete with warning flags, reflectorized center sections and brackets for flasher lights. Stands 36" high; available in 4, 6 and 8 ft. lengths. Collapses for quick storage in heavy-duty, fibre board shipping-carrying container. Write for free folder.

Closed

WEST SIDE IRON WORKS, Inc.
327 Front Avenue, N.W. — Grand Rapids 4, Michigan

Speed-watch Twins

ONE MAN SPEED ENFORCEMENT

Radar
★ ALL TRANSISTOR
★ WEIGHING 8 POUNDS
★ DRAWS ON 1.6 AMPS
★ LONG OR SHORT RANGE
★ TRANSFERABLE FROM ONE CAR TO ANOTHER

Electric Timer
★ AUTOMATIC OPERATION
★ PROVABLE ACCURACY
★ FINGER TIP CONTROL
★ INEXPENSIVE
★ LARGE DIAL

TRAFFIC HOUSE, INC.
Marshall, Michigan

Circle Item No. 7—Reader Service Card

Off-the-Job

From Page 14

general manager, 4.5; to the works manager, 5.9; to the industrial relations director, 10.8, and to the factory superintendent, 11.0."

● **Citizen Safety Groups**—In particular, state and local safety councils should be encouraged. This can be done through the creation of off-the-job committees representative of the leading employers of the community. If top management of these employers is interested in the council's operations, then those operations can more rapidly develop a safety climate for the community and provide forums for discussion and technical assistance through committees composed of men with technical know-how.

● **Public Officials** — Here, our state, county and local police and traffic engineers have been of immeasurable help. They have installed traffic control lights to blend plant traffic into the main streams of traffic. They have stationed officers to direct traffic at strategic points.

Henry A. Barnes, commissioner, Department of Transit and Traffic, Baltimore, states: "This department offers free consulting services to any commercial or industrial plant planning a development in Baltimore City . . . will lay out their parking lots, the traffic flow and direction of facilities within the plant area, and will provide recommendations for the installation of traffic control devices on their property.

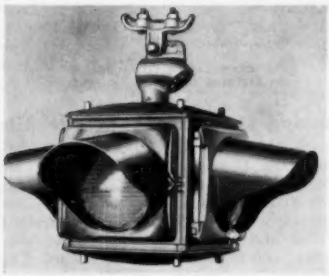
"In addition . . . any industrial plant having a sufficient volume of pedestrians or vehicles entering or leaving their facility daily to meet necessary warrants for a traffic signal, is permitted to install a signal—subject to the design plan provided by this department — with the understanding that the cost of the signal will be borne by the private company and that they will furnish the electrical energy for its operation. . . . These services are provided to commerce and industry without charge. . . . Because of these services, we enjoy excellent relations with the retail and industrial people in our area."

● **Labor Organizations**—We need to work with labor organizations—again through the Labor Conference of

To Page 47

NEW... SAFETY EQUIPMENT

Publication of product announcements in this section should not be construed as endorsement or approval by the National Safety Council.



Flashing Beacons

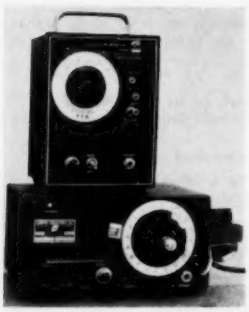
These beacons are designed for intersections where traffic conditions are often hazardous but the traffic counts do not justify the installation of traffic signals.

Beacons with motor flashing switches should be installed as warning signals in front of roadway obstructions, or to call attention to important intersections hidden around curves. They serve as valuable warning signals when installed at schools, fire stations, unexpected dead end streets and steep hills.

Non-adjustable beacons are designed for use at right angle intersections; adjustable beacons are for intersections where the angle between the streets is other than 90 degrees. In the adjustable type, each optical unit may be separately adjusted so that it may be aimed directly toward the traffic which it controls.

The beacons are available with an arrow lens instead of a plain lens and they may be equipped with a base light.

Crouse-Hinds Co., Wolf & Seventh St., Syracuse 1, N. Y. (Item 41)



Mobile-Radio Frequency Measuring System

The PPM Package is a system for measuring the frequencies of mobile-radio transmitters to the F. C. C. split-channel tolerance of 0.0005 per cent (above 50 MC). The package consists of a Micrometer Frequency Meter and a modified Measurements Corporation Model 111 Crystal Calibrator. When used in conjunction with a WWV receiver, transmitter-frequency checks can be made to an accuracy of better than one (1) part per million.

The crystal calibrator is modified to include a 3½" diameter dial which tunes the crystal and is calibrated in Parts Per Million, with a range from + 25 to — 25 PPM. The crystal calibrator produces harmonics spaced 250 KC apart, up to 500 MC and beyond; the output frequency of the Micrometer Frequency Meter mixes with the 250-KC harmonics and creates a new side frequency which can be located on any transmitter channel.

Operation consists simply of setting the PPM Meter to zero on WWV, adding an easily-computed frequency from the Micrometer Frequency Meter, then reading transmitter-frequency deviation directly in Parts Per Million from the dial.

Lampkin Laboratories, Inc., Bradenton, Fla. (Item 42)

Parking Line Marker

The "Little Stripe-R" parking line marker is designed for the private lot operator. It paints a 4 in. line with any kind of traffic paint as fast as the operator can walk.

It is sturdily constructed of steel and aluminum with hard rubber wheels and it has removable brushes for easy cleaning and a non-clogging valve which can also be easily cleaned.

"Little Stripe-R" paints ribbon like lines and makes all parking areas well defined.

Wald Mfg. Co., 67 N. Ninth St., Lemoyne, Pa. (Item 43)

Traffic Cone Flasher

Model No. 630 Visi-Flash transistorized warning light improves nighttime use of traffic cones. It produces approximately 6 beam candle power through a red or amber plastic 360-degree lens, and has a duration strength of 400 hours. The flash lasts 1/10 of a second and pulsates 65 times per minute. The circuit housing is painted beacon yellow and the battery case is metallic gray. The unit is loaded with four "D" batteries in the same manner as an ordinary flashlight. The flashing is controlled by the battery case cap which, when turned clockwise, activates the lamp. Reversing the turn extinguishes the light.

R. E. Dietz Co., 225 Wilkinson St., Syracuse 1, N. Y. (Item 44)

Electronic Speed Measuring Device

The Foto-Patrol electronic device photographs speeding cards. The photo shows the license plate number, exact speed, date, hour and minute, the location and any other data that might be pertinent to the operator.

The self-contained unit features an all transistor speed computer, fully automatic camera, a 100 foot film capacity giving 1000 pictures and storage battery power. A police car is not required for operation.

The Foto-Patrol may be rented and the rental charge includes batteries, road tapes, film, developing, prints, service and repair costs.

American Foto-Patrol Corp., 2 W. 46th St., New York 36, N. Y. (Item 45)

SAFETY PRODUCT LITERATURE

Transistorized "Road-Commander"

Lawrence, Inc., P. O. Box 5106, Seven Oaks Station, Detroit 35, Michigan, has issued a brochure describing their all transistor public address and radio amplifier system known as the "ROAD-COMMANDER." The publication shows how the equipment may be used as a P. A. System, a Mobile Radio Amplifier, and a Siren Amplifier. Transistors are used in the circuitry.

For more details circle No. 81 on enclosed return postal card.

School Safety Patrol Helmet

Designed to provide more effective warning to motorists to "watch out for children," a new school safety patrol helmet combines distinctive, easily identified styling with high-visibility color which catches the eye even under the most adverse weather conditions. Designated "The Cair-Cap" by its manufacturer, Chamberlain Aviation, Inc., Akron Airport, Akron, Ohio, the helmet's attractive space-age styling also builds the young patrolman's pride in his job, making him do his best at all times, and minimizes recruitment and turnover problems. Literature gives full details.

For more details circle No. 82 on enclosed return postal card.

Automotive Lighting and Safety Equipment

Catalog No. 59 describes more than 40 product categories of the Automotive Division of the R. E. Dietz Co., 225 Wilkinson St., Syracuse 1, N. Y. Catalog attractively illustrates each product and lists basic components and replacement parts information for all items.

For more details circle No. 83 on enclosed return postal card.

Flasher Light

R. D. Fageol Co., Kent, Ohio, announces a new 2-page, 3-color bulletin L-911-A, describing their Model HD-2T Transistorized Safety Flasher Light. Well illustrated, it explains how the transistor circuit improves the light's performance and eliminates field service or adjustment. It also lists other features such as the tamper-proof locking device, heavy-duty 8-cell battery, special optical plastic fresnel lenses, etc.

For more details circle No. 84 on enclosed return postal card.

Traffic Controllers for Isolated Intersections

The FT-300 Series of electronic traffic controllers provides efficient and economical traffic control at intersections where multi-purpose control systems are not required. Crouse-Hinds new Bulletin 2720 "Controllers Designed for Isolated Intersections," lists and describes the new series and briefly describes Crouse-Hinds traffic signals, which may be used with them. Crouse-Hinds Co., Syracuse 1, N. Y.

For more details circle No. 85 on enclosed return postal card.

Traffic & Pedestrian Signals

Traffic and Pedestrian Signals that offer a wide range of installation and operation flexibility are given through coverage in descriptive Traffic Signal Bulletin A-10. Eagle Signal Co., Municipal Division, Moline, Ill.

For more details circle No. 86 on enclosed return postal card.

Safety Signs

You will find warning signs to meet every municipal requirement in 45-page Catalog C-4, now being offered by Standard Signs, Inc., 3190 E. 65th St., Cleveland, Ohio. Signs are of steel finished in either synthetic or porcelain enamel, for inside and outside use.

For more details circle No. 87 on enclosed return postal card.

"America's New Mounted Police"

Helicopter police protection at half cost can become a reality for your community, if it participates in a matching funds plan as set up by the Office of Civil and Defense Mobilization. The brochure, "America's New Mounted Police" gives full facts on OCDM procedures and describes established community helicopter practices. Commercial Div., Hiller Aircraft Corp., Palo Alto, Calif.

For more details circle No. 88 on enclosed return postal card.

Traffic Lines

A technical data sheet giving standards for application of reflectorized thermoplastic pavement marking material has been issued by Cataphote Corp., Toledo 10, Ohio. The material is available under the trade name Catatherm, in white and federal yellow. It is guaranteed to provide not less than nine times the useful service of a good quality paint stripe, and retains maximum reflectivity.

For more details circle No. 89 on enclosed return postal card.

Parking Meter Thwarts Vandals

Duncan Parking Meter, Div. of Motor Products Corp., 835 N. Wood St., Chicago 22, Ill., specifically developed this parking meter to combat the increasing and costly destruction of parking meter equipment and theft of meter revenue. Confident that it can give vault-like protection, the company (with each meter order) will issue and pay for an insurance policy indemnifying the purchasing city against physical loss due to vandalism. Full details are available from the company.

For more details circle No. 90 on enclosed return postal card.

Durable Traffic Markings

This thermoplastic traffic marking material applies with speed, dries almost instantly, is highly visible and durable. It meets the strict standards of safety demanded by the new Interstate Highway System. Brochure gives complete details on latest installations of Perma-Line and specifications. Veon Chemical Corp., 22-09 Bridge Plaza North, Long Island City 1, N. Y.

For more details circle No. 91 on enclosed return postal card.

Warning Light and Barricade Kits

Pacific Mercury, 13232 Leadwell, Hollywood Park 1, Calif., has made available literature describing their line of warning lights and barricade kits. The lights are transistor neon or incandescent flasher warning and are said to be lighter, stay brighter and require less maintenance. The barricades are sturdy, but should they be damaged, permit impaired parts to be replaced easily and economically.

For more details circle No. 92 on enclosed return postal card.

Automatic Parking Control

The Parcoa Division of Johnson Fare Box Co., 4619 N. Ravenswood Ave., Chicago 40, Ill., has introduced a new automatic parking system that prevents error in loss revenue. It is especially designed for flexible operation and can be adapted for use in municipal parking lots. Literature gives full details.

For more details circle No. 93 on enclosed return postal card.

Transistorized Power Megaphone

The manufacturer of the rugged, 3¼ pound Falcon Chief, which gives up to 6000 two-second amplified messages from standard replaceable battery and clearly projects the human voice up to ½ mile, is offering free an informative booklet entitled, "Sounds for Safety." Falcon Alarm, Inc., Summit, N. J.

For more details circle No. 94 on enclosed return postal card.

Law Enforcement Equipment

A spiral-bound booklet, available from Federal Laboratories, Inc., Saltsburg, Pa., contains an impressive complement of equipment for law enforcement agencies. Included are tear gas products and equipment, ammunition, firearms and accessories; fingerprint kits and accessories; emergency signal-lights, sirens, flares, megaphones, and restraint equipment.

For more details circle No. 95 on enclosed return postal card.

Reflective Traffic Markings

Bulletin "SD" describes a new self-adhering traffic marker that takes no get-ready, no warm-up and is easy to apply; Catalog PP-59, reflective spheres and binder ready-mixed for latent reflectivity; Folder G-S-58, glass spheres for reflectorizing paint; and Bulletin P-256, a sign finish with high refractive index that gives soft-glow legibility at both long and short distances. For copies, write Prismo Safety Corp., Huntingdon, Pa.

For more details circle No. 96 on enclosed return postal card.

Off-the-Job

From Page 44

the National Safety Council—in the encouragement of member participation in accident prevention activities and the support given the movement by their publications.

● **Public Information and Public Education**—Overall, we need to develop a more effective program of public information and public education for workers and their dependents alike.

Finally, there is one major need that I should like to mention.

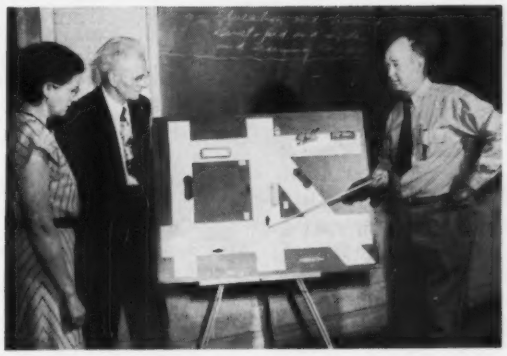
Consider what has been done in the field of manufacturing to reduce on-the-job fatalities during the past quarter century. Deaths per 100,000 workers have been knocked down from 25 in 1933 to 11 in 1958. That is a substantial accomplishment. I think this was done because management in these industries researched the problem. It brought in specialists. It learned the real causes of accidents and concentrated on their elimination. It didn't waste its resources fighting imagined causes of accidents.

In the off-the-job field we still have not isolated the real from the imagined causes. Our lack of knowledge about accident causes is certainly our greatest weakness. We simply haven't undertaken research on either the scale or the urgent timetable that the problem warrants.

At our present rate, our economic losses from traffic accidents alone during the next decade are going to total well beyond $60 billion. It's money that's going to come out of your pocket and mine. If research into new and improved methods of accident prevention could cut that loss by just one-fourth—the savings would be over $15 billion. How much research would you be willing to spend to save $15 billion—and that's just the cash and not the lives and limbs.

Sheer common sense and business acumen would dictate substantially increased expenditures for prevention. My suggestion — modest enough — would be to call for the expenditure of a minimum of $1 billion during the next ten-year period for a crash program of traffic safety research.

Circle Item No. 8—Reader Service Card



★ ★

THE "EYES" HAVE IT . . . .

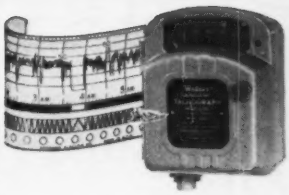
Here is an aid that has proven practical in teaching visually the principles of safety. It's simple, effective and works wonders in teaching your drivers.
The MAGNO SAF-T BOARD is the result of studies by outstanding safety instructors and engineers. Safety directors, traffic managers, driving instructors, insurance agents and adjusters get a clear picture of how accidents occurred visually by reconstruction of conditions.
It is now being used from coast to coast by fleet owners, insurance and public utility companies, colleges and schools, and many other concerns interested in public safety. Consisting of a BOARD with typical street intersections on one side. The other side is a BLACKBOARD on which any street or road situation can be drawn with chalk and then erased. It has scale models of vehicles, traffic markers and accessories that can be placed in any conceivable traffic situation.

Write for our folder. It contains full information.

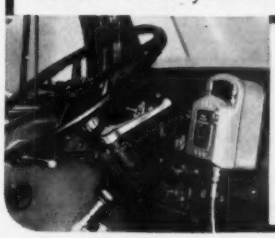
MAGNO SAF-T BOARD© EMIGSVILLE, PA.

NOW--EXTENDED RECORDINGS of your truck operations

NEW
Wagner-Sangamo
TACHOGRAPH
records up to 31 days on a single "strip" chart



This new model Tachograph permanently records truck operation, on roll-type charts, designed for 8, 15, or a maximum of 31 days.
Mounted on the dash of the truck, this recording speedometer makes a graphic record of truck's operation. It indicates truck stationary time with engine on,—with engine off; duration of stops; speeds and distances traveled.
Data helps you plan better routing, curtail wasted time, cut costs, and helps make drivers safety conscious . . . For details, mail the coupon.



Wagner Electric Corporation
6467 Plymouth Ave., St. Louis 33, Mo., U.S.A.
Please send FREE copy of Bulletin SU-140.
Name_____
Company_____
Address_____
City & State_____
We operate_____ (Number) Vehicles
WS60-3

Circle Item No. 9—Reader Service Card

Union's Place

From Page 34

gans, and that you are doing all in your control to provide the kind of equipment and operating conditions that are in the best interest of safety.

Then there is the matter of rewarding the good and punishing the bad. Most safety programs have various schemes by which employes are encouraged to improve their safety records or maintain their already satisfactory records by the hope of receiving certain rewards for their efforts. And most programs, on the other hand, contain systems of inspection to discover operators who are not operating safely and to impose various forms of discipline which may range from a reprimand or a period of retraining to discharge of the man who is incurably accident prone. I have no serious objection to giving individual recognition to the men who achieve outstanding records; in the long run, however, I think that a system which places the greater emphasis on the performance of the *group* is the more likely to succeed.

So far as the nature of the reward is concerned, I feel that safety awards should not be used as a substitute for what the management is really obligated to provide on grounds that have nothing to do with safety. I know, for example, that a number of the agreements in this industry provide uniforms, or parts of uniforms, as a reward for operating without a chargable accident over a stated period. I do not believe that such a system is fair to the employes. Consistent with the practice that has been followed in many of the properties for years, the uniform which an operator is required to wear should be provided by the management.

Fairplay Best for All

So far as disciplinary action is concerned, the basic standards we insist upon are simple. We want even-handed, fair-minded justice in which the penalty fits the crime, and the offender is given some opportunity for rehabilitation before he is subjected to disciplinary action. We want accident cases investigated fairly and thoroughly with a view to determining whether the operator was really at fault.

If blame is to be placed, we want it placed where it belongs. When employees are charged with the violation of safety rules, we believe that they are entitled to have their word be given at least some weight against the word of an undisclosed professional checker. We want a system of discipline in which some distinction is made between a first or rare offender and the incurable miscreant. We want a system which recognizes the fact that we are all human, we all err, and we are all entitled to at least a second chance.

Be consistent and fair. This union will not try to whitewash those who by their conduct have shown themselves to be a menace to the company, the public, and their fellow workers.

Finally, a safety program that deserves the support of the union and of the employes is one in which safety training is made an integral part of the employe's job and the management's business. I suggest that it is about time we realized that if safety training is to work it must be accepted as a basic part of the function of the transit company; a basic part of the job of its employes; and not some extra curricular fringe.

At present we frequently find one of two equally undesirable practices. In some instances attendance at safety training sessions is purely voluntary.

A man has a hard time deciding whether he should join in the company safety meeting or the company bowling team and the management does not seem to really care which choice he makes.

In other instances the employe is required to attend safety meetings and training sessions but without any compensation for the time he spends. The natural and normal response is to regard this as an imposition and a form of punishment.

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The answer is simple. You do not now leave it to the operator to decide, for example, whether or not to fill out an accident report. You require that he do so, and for the time he spends doing it he is paid. If you are really serious about safety training sessions, they should be treated in exactly the same manner.

The various do's and don'ts I have outlined will result in the kind of legitimate, sincere and fair safety program that this union can and will support. And if all that you ask of us is that we give such a program our blessings and encourage our members to give their wholehearted cooperation in the matter, this much we will gladly do. But if that is all that you ask of us—and in most instances thus far that is all we have been invited to do—you are, in my judgment, failing to employ the full potential for cooperation between management and this union in the furtherance of safety.

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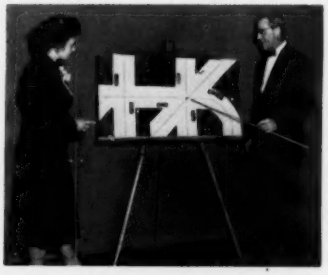

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Vision

From Page 25

ings. Nearly half of today's drivers have never had an official vision test of any kind.

Conditions found in the pilot survey are also confirmed by routine examinations of the millions of adults who visit optometrists and ophthalmologists periodically for vision care. Driving has become so common that the vision of the typical adult probably closely approximates the vision of the typical driver.

As a result of the survey, many organizations requested the opportunity to develop their own vision screening program.

In Kansas City, Mo., the Women's Chamber of Commerce, working with the local police department and optometric society, designed the Drive-O-Rater, a vision clinic on wheels financed with the help of a local utility. [See TRAFFIC SAFETY, June, 1959.] The Drive-O-Rater is in constant use. It is parked on supermarket lots, taken to local expositions and loaned to various civic groups for use during meetings. More than 10,000 local citizens had their vision screened in the Drive-O-Rater during a recent automobile show.

In Greenville, S. C., and other cities in that state, traffic courts, using voluntary assistants from local groups in the community, screen the vision of all drivers assigned to driver improvement clinics.

School officials finding that teenagers, under the supervision of local optometrists, can screen their own vision skills for the driving situation have encouraged their driver educators to incorporate voluntary screening as a part of the driver education curriculum.

Taxi-cab companies in Brooklyn, N. Y. took advantage of "Save Your Vision Week" during March of last year to ask for voluntary vision screening of all their cab drivers.

The North Dakota Junior Chamber of Commerce and the North Dakota Homemakers Organization, with the help of the North Dakota Optometric Association, have sponsored a continuous voluntary screening program throughout their state for the past two years. Testing results are presented to

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the governor and distributed throughout the state.

To cope with the hundreds of requests for information on how voluntary vision screening programs can be sponsored by clubs, societies and other organizations, the Motorists' Vision and Highway Safety Committee of the American Optometric Association has prepared a portfolio of materials as a program guide. To obtain the portfolio titled "The National Survey of Automobile Drivers Vision" organizations need only contact the local society of the American Optometric Association listed in their community's telephone directory. The local society will furnish supervision and speakers to explain further how local safety organizations can sponsor voluntary vision screening programs.

Interested public support groups (a local safety council, P.T.A., or service club) might well direct their activities toward these "vision for driving" goals:

1. Periodic re-examination of the vision of all drivers. Millions of drivers have had their licenses repeatedly renewed since the days when no eye tests were required for licensing; more millions who had an original test have never been tested again—in spite of the fact that aging is the greatest single contributor to poor vision.

2. Thorough vision examinations for accident repeaters.

3. More extensive use of licensed vision specialists as consultants to licensing examiners, traffic courts and other government agencies dealing with highway safety.

4. Adoption of minimum vision standards in the following skills:
   a) Acuity in the better eye
   b) Glare resistance
   c) Adaptation to low illumination
   d) Distance judgment
   e) Breadth of field of view
   f) Color vision

5. Dissemination of more information on the fact that drivers lack necessary visual skills without knowing it, and that almost all shortcomings can be corrected with proper vision care.

6. Replacement of antiquated signs developed for the days of the Model-T with modern signs designed for fast reading at high speeds.

7. Better illumination of all roads and highways so that traffic ways are "bathed in light" and sharp light contrasts with fatiguing shadows are removed.

Voluntary screening, voluntary correction and voluntary caution can bring results that compulsory laws may never achieve.

For more details on the survey referred to and the joint program now underway, any of the following major participants may be consulted:

Motorists' Vision and Highway Safety Committee

American Optometric Association
4030 Chouteau Ave.
St. Louis 10, Mo.
Safety Division

The Woman's Auxiliary to the American Optometric Association
4013 Byers Ave.
Fort Worth 7, Tex.

President's Committee for Traffic Safety
General Services Building
Washington 25, D. C.

Women's Division
Automotive Safety Foundation
200 Ring Building
Washington 6, D. C.

Inter-Industry Highway Safety Committee
206 Ring Building
Washington, D. C.

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RESEARCH REVIEW

A NATIONAL SAFETY COUNCIL PUBLICATION

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National Safety Council

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The RESEARCH REVIEW is a quarterly supplement published by TRAFFIC SAFETY for the reporting of research that relates to traffic safety. This service is designed to provide those who conduct research, and/or utilize research findings, information that contributes to, advances, or clarifies the body of traffic safety knowledge. The value of research and the prevention of duplication and overlap is enhanced by prompt reporting. To fulfill this purpose, the RESEARCH REVIEW will present completed reports, abstracts, summaries of research in progress, and information regarding contemplated research.

The opinions expressed and conclusions drawn are entirely those of the various authors of these papers. TRAFFIC SAFETY and the National Safety Council accept no responsibility for them, and publication should not be deemed as either endorsement or approval of the ideas expressed or devices described.

Manuscripts appropriate for publication should be submitted to the Research Division of the National Safety Council, 425 North Michigan Ave., Chicago 11. Manuscripts cannot be returned unless accompanied by a self-addressed, stamped envelope. Editorial handling will be easier if manuscripts are typed, double-spaced in triplicate, and accompanied by an abstract of 200 words or less and all original art work. Any other information regarding research in progress or contemplated research can be submitted in any form that outlines the full particulars, i.e., investigator, problem, hypotheses, methodology, desired or expected outcomes, etc.

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RESEARCH BRIEFS

Metropolitan Award

The Metropolitan Life Insurance Company will make an award of $1,000 for the research project in any field of accident prevention judged to be the most significant contribution toward the reduction of accidental injuries and deaths.

This award will be made to give recognition to investigators now studying the causes of accidents, so as to encourage research workers in the various sciences to include the problem of accident causation in their studies.

Research may come from any of the various disciplines, i.e., biological, physical, or social, and can include interdisciplinary undertakings.

Research may be submitted by the investigator, may be invited by the National Safety Council Committee on Research and Education, or may be nominated by anyone familiar enough with a research project to do so. The award will be administered by the National Safety Council.

For further information write to: John J. Flaherty, Director, Research Division, National Safety Council, 425 North Michigan Ave., Chicago 11, Ill.

Articles in This Issue

Irby and Jacobs, in their report "Experimental Patrol Intensification at a Military Base," describe an investigation into the causes of off-duty private motor vehicle accidents at the U. S. Marine Corps base, Camp Lejeune, N. C. By taking an epidemiological approach and employing the countermeasure of having patrol cars stop at random private automobiles bearing a Camp Lejeune base tag, they found that the mean weekly accident experience prior to the countermeasure, when compared to the nine-week period after its termination, resulted in approximately 33 fewer military drivers being involved in accidents than would have been expected on the basis of previous experience.

"Human Factors in Highway Safety," by Dr. T. W. Forbes, emphasizes the need on the part of officials, designers, traffic engineers, and safety experts to recognize the importance of specific scientific information regarding the driver. He discusses what we know and do not know about perceptions, judgments, knowledge, personality factors, and other elements that relate to the driver in the driving task. This article should prove provocative for investigators in the field.

Shumate and Crowther explore speed behavior in some detail in their article "Variability in Fixed-Point Speed Measurements." They point out the pitfalls left open to the investigator who employs fixed-point speed measuring methods. They deal with the development of sampling methods for studying vehicle speeds using fixed-point methods of measurement. The practical method which they employed lead to the finding that there was variability inherent in the data which might limit its value as a reliable research device. This being an interim report, they hope that many of the questions they raise may be more satisfactorily answered as additional data are gathered and refined.

In a preliminary report by John O. Moore and Robert Lilienfeld, entitled "The Child in Injury-Producing Automobile Accidents," it was found that the proportion of children in injury-producing accidents is markedly lower than the proportion of the national population which they represent. It was also found that, while head injuries were somewhat more frequent among children, children were also injured less severely than adolescents or adults. A number of other findings along with illustrative tables furnish a great deal of useful information to investigators in the field.

William E. Tarrants in his report discusses the results of an experiment to establish the relationship between driving records, field driving performance, and laboratory driving performance of professional automobile drivers. He concludes that what other experimenters have considered as criteria of driving performance cannot be accepted for the population he sampled. He further concludes that neither the Rogers-Lauer scale nor the Auto Trainer is suitable in this particular case. He points out the need for evaluating other existing potential criteria of driving performance, and he also indicates that more refined instrumentation might be the answer.

John J Flaherty

THE AUTHORS

John O. Moore

Mr. Moore is Director of Automotive Crash Injury Research at Cornell University. Since September, 1955, he has also been a research associate at Cornell University Medical College.

In 1936 he obtained his B.S. degree in chemistry and biology from Wake Forest College and did graduate work in biological chemistry at the Wake Forest School of Medicine and University of Michigan Medical School.

He served as Chief of Crash Injury Research for the USAF prior to joining Republic Aircraft in preventive accident design. He assumed his present duties in 1954.

Thomas S. Irby

A staff member at Dunlap & Associates, Inc. since 1952, Mr. Irby has contributed to numerous studies in Operations Research, human engineering, etc. in connection with military weapon systems. In the area of accident research, he has had considerable experience on various projects since 1954 relating to the development of statistical techniques for accident research, and the control of industrial and highway accidents. Later he was Project Director for studies dealing with the problem of the private motor vehicle accident involving off-duty servicemen. Mr. Irby holds an M.A. degree in Psychology from the Ohio State University.

Herbert H. Jacobs

For nine years at Dunlap and Associates, Inc., Dr. Jacobs has served as Director or Responsible Officer for accident research, directing studies on accident proneness, development of statistical methodology for accident research, evaluation of safety education, highway accident studies, industrial accident studies, etc. Dr. Jacobs has also directed his company's activities in Operations Research and in 1958 spent several months abroad advising the Japanese Government and industrial groups on accident research and Operations Research. He holds a B.S. degree in Chemical Engineering, an M.S. degree in Mechanical Engineering, and a Ph.D. degree from Columbia University in Industrial Engineering.

Robert P. Shumate

Shumate was a trooper in the Maine State Police for 6 years, 1949-1955. During this time, in 1953-1954, he attended the Traffic Institute at Northwestern University, where he was a participant in the 9-month training program in traffic police administration. In 1955, he joined the field staff of the Traffic Institute, and, in this capacity, developed and directed a training program for the newly organized Wisconsin State Highway Patrol. He was appointed to the position of Assistant Director of Research and Development at the Traffic Institute in 1957, and was made Associate Director of Research and Development in 1958. He is presently Assistant Director for Research and Development of the Field Service Division, International Association of Chiefs of Police, Washington, D. C. In this position, he is engaged in directing an expanding program of research in motor vehicle traffic supervision, and the development of research projects in other major areas of police activity.

Robert Lilienfeld

Mr. Lilienfeld has done research with Cornell University's Automotive Crash Injury Research program since 1956. Born in New York City in 1927, he received the B.A. and M.A. degrees from New York University in 1951 and 1952 with concentrations in mathematics and statistics.

At present Mr. Lilienfeld is connected with New York University's Graduate School of Public Administration and Social Service. As a consulting statistician he is analyzing their sample of injury cases in the files of the Workmen's Compensation Board of New York State. This study will indicate the types of injury which become compensation cases, costs and length of treatment, types of rehabilitation treatment required, etc.

William E. Tarrants

Mr. Tarrants is a graduate of the Ohio State University where he earned the degrees of Bachelor of Industrial Engineering and Master of Science in Industrial Engineering with a major in the safety engineering field.

He formerly held the position of instructor in industrial engineering at the Ohio State University. He has served as a consultant in safety program evalution for the Division of Safety and Hygiene, Industrial Commission of Ohio, and as a Research Associate for the Ohio State University Operations Research Group. He was a ground safety officer in the U. S. Air Force between 1951 and 1957 during which time he served as Chief, Ground Safety Division, Central Air Materiel Area, Europe, and as a safety officer with the Armed Forces Special Weapons Project.

Mr. Tarrants is presently an instructor and research associate at the Center for Safety Education, New York University. He is a member of the American Institute of Industrial Engineers, the American Society of Safety Engineers, and is a licensed Professional Engineer.

Richard F. Crowther

Mr. Crowther is a native of Toronto, Canada. He is a graduate of Pickering College, Newmarket, Ontario. He received his B.A. from Queens University, Ontario, in 1952. Following graduation he spent three years on the research staff in the Canadian headquarters office of the Prudential Insurance Co. in Toronto. Since 1955 he has been engaged in graduate work in economics at the University of Chicago, and is continuing his work there (in absentia) toward a Ph.D. degree. He joined the research staff of the Traffic Institute at Northwestern University in early 1959. Since September 1, 1959, he has been engaged in research with the Field Service Division of the International Association of Chiefs of Police, Washington, D. C.

Theodore W. Forbes

For the past thirty years Dr. Forbes, assistant director for research and professor of psychology at Michigan State University's Highway Traffic Safety Center, has been a teacher, lecturer and researcher specializing in highway traffic psychological and engineering problems and has done considerable work under the Office of Scientific Research of the federal government.

Born in Honolulu, Hawaii, he received the A.B. and M.A. degrees from Oberlin College, the Ph.D. from Ohio State and was certified in traffic engineering at the Harvard Traffic Bureau. He has held positions with the N. Y. State Psychiatric Institute; Barnard College; the Harvard and the Yale Traffic Bureaus; Stevens Institute of Technology; University of Pennsylvania; Harvard Psycho-Acoustic laboratory; University of Hawaii and the University of California at Los Angeles.

Prior to his post as program director in charge of highway research at the American Institute for Research, Dr. Forbes was executive secretary and later technical director of the Committee for Highway Safety Research, National Academy of Sciences-National Research Council.

He is an associate of the Highway Research Board and committee chairman on Road User Characteristics; member, Research Committee, Advisory Council to the President's Committee for Traffic Safety; individual member of the National Safety Council; fellow in the American Academy for the Advancement of Science and the American Psychological Association; member, Acoustical Society of America; associate member, Institute of Traffic Engineers.

An Epidemiological Approach To the Control of Automobile Accidents:

Experimental Patrol Intensification At a Military Base

by Thomas S. Irby and Herbert H. Jacobs

Introduction

Private motor vehicle accidents to military personnel while off duty produce more deaths than any other single category of military accidents. In spite of administrative efforts by the three services to reduce the toll, there has been no observable reduction in the death rate in the last five years. There is reason to believe that the lack of progress may be attributed to three factors:

(1) The causes of the accidents have not been adequately identified.

(2) The countermeasures used have no demonstrated effectiveness.

(3) The role of the soldier as a citizen during his off-duty hours often places constraints on a base commander, preventing his exercising traditional control over the members of his command.

This study describes an investigation into the causes of off-duty private motor vehicle accidents at the United States Marine Corps Base Camp Lejeune, North Carolina, and an experimental evaluation of the effectiveness of a countermeasure designed for local conditions on the basis of the information obtained. The countermeasure involved random car-stopping along selected routes at specified times.

This study is abstracted from reports to the Commission on Accidental Trauma of the Armed Forces Epidemiological Board. It was supported by the Research and Development Division, Office of the Surgeon General, Department of the Army, and conducted for that office by Dunlap and Associates, Inc., Stamford, Conn.

The epidemiological approach to the study of accidents has proved a valuable methodological framework for structuring the investigation of basic accident causes and for generating fundamental principles for guidance in attacking specific accident problems. In medical research, this approach attempts to identify causes of disease in terms of interrelationships among host, agent, and environment—or analogously, in the present accident research, the human automobile driver, the automobile, and the many physical and social environmental variables.

This research philosophy has led to the following sequence of steps in the research process which has been employed in this study:

(1) Collection of data pertinent to the accident situation and the people involved.

(2) Development of a rationale for each class of accidents from these data.

(3) Invention of countermeasures.

(4) Introduction and evaluation of countermeasures.

The point to be emphasized strongly is that the countermeasure hereafter described is not considered to be as important in itself as it is an *example* of the research philosophy outlined above. It is the belief of the authors that present-day accident research is preponderantly information-oriented, rather than action-oriented. Only rarely are research data in this field translated into a usable form for administrators whose charge it is to take preventive or remedial steps against accidents.

This study exemplifies a successful collaboration between researchers and administrators in defining the problem, developing and introducing a countermeasure, and evaluating the magnitude and duration of its effectiveness.

Identification of the Problem

The usual view of the causes of private motor vehicle accidents to service personnel while off duty is that they are associated with frantic efforts to make the most of a three-day pass or of a more extended furlough. These efforts are the context of the speed, fatigue and night driving which are frequent concomitants.

Current accident records for a six-months period at Camp Lejeune were matched with control data from driver personnel sampled at the gate and subsequently interviewed. The data show that the following factors correlated disproportionately with the accident experience.

(1) The younger marine (age 18-25), comprising 44 per cent of the driving population, incurred 73 per cent of the accidents.

(2) The lowest three enlisted grades, constituting 17 per cent of the driving population, contributed to 48.6 per cent of the accidents. Conversely, the upper three grades were 57 per cent of the driving population and contributed to 43.1 per cent of the accidents.

(3) Unmarried marines are 18 per cent of the driving population and sustain 53 per cent of the accidents. Conversely, married men represent 82 per cent of the population and are involved in only 40 per cent of the accidents.

(4) Twenty-two per cent of the driving population reside on the base but these marines contributed 63 per cent of the accidents.

All of the foregoing point to age as a central factor. In addition to these correlates of accidents, the following circumstances were identified:

(5) Seventy-nine per cent of the accidents occurred on base or within 10 miles of the military reservation. Only one per cent occurred outside a 50-mile radius.

(6) Seventy-three per cent of the accidents occurred between 6 p.m. and 6 a.m. Control population data indicated that only 26 per cent of the driving is done during this time.

(7) The accidents are related to recreational rather than to long-distance commuting or military activities.

While the recorded evidence was not conclusive, there was reason to believe that driving after drinking played a prominent role although the incidence of driving while *intoxicated in a legal sense* was small. The principal violations with which drivers were charged are:

(1) Reckless driving (24 per cent)

(2) Failure to yield right of way (19 per cent)

(3) Following too close (17 per cent)

(4) Speeding (17 per cent)

(5) Too fast for conditions (10 per cent)

(6) Drunken driving (10 per cent)

In the interest of brevity other findings are omitted but the foregoing served to modify our preconception that the highly publicized pressure driving over long distances was the context of night driving, speed and fatigue. The "recreational" context replaced it.

The Countermeasure

Five high-accident highway sections were defined by reference to the accident records. Two military police cars were scheduled randomly to patrol these areas simultaneously at predetermined times during off-duty hours. Total hours of patrol in a given area over a 10-week period were calculated to be proportional to the number of accidents which had occurred previously in specific time periods.

The two patrol cars stopped, *at random,* private automobiles bearing a Camp Lejeune base tag identifying the owner as an enlisted man, of sergeant rank or lower. The military police were instructed to stop as many cars as possible in the patrol area to which they were assigned within the designated hours of the patrol.

Using a questionnaire prepared by us, patrolmen asked each stopped driver for personal information, the origin and destination of the trip he was making, etc., without explaining in detail the purpose of this procedure. However, patrolmen took into protective custody drivers judged to be "driving under the influence."

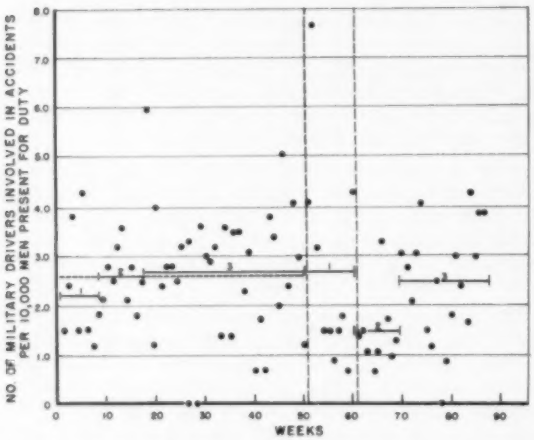
The intended effect of this countermeasure was twofold: (1) to remove hazardous drivers from the highway, thereby reducing the likelihood of accidents from this source, and (2) to implant a feeling of ever-present surveillance by highway patrols, implicit in which was an element of *uncertainty* as to (a) what the military police were *really* doing, and (b) who might be stopped, since patrolmen informed drivers they had been selected at *random*. This latter and most important feature of the countermeasure was calculated to induce more cautious driving behavior, particularly on the part of that subpopulation contributing most to the accident experience. By means of informal, word-of-mouth communication among marines, it was hoped that the number of men who actually learned of the military police activities would exceed the number stopped. With such a substantial proportion of military drivers exposed directly or indirectly to the measure, it was felt that any resultant effect, if observable at all, would be seen toward the latter part of, or following, the 10-week patrol period.

Prior to the initiation of these special patrols, briefing sessions were held with Camp Lejeune military police officials and the men who would be directly involved in the execution of the experimental patrol procedure. To promote uniformity, printed instructions were given each patrolman. Procedural questions and anticipated ambiguous or special situations that might arise were discussed, and decisions were made as to how they would be handled.

The special patrols were initiated at 1600 hours (6:00 p.m.) December 16, 1957, and were terminated 10 weeks later at 0600 hours (6:00 a.m.) February 24, 1958. During this period 1,469 drivers were contacted by the patrols. Of this number, 233 drivers or 16 per cent were stopped two or more times, so that only 1,236 *different* men were contacted.

The Effectiveness of the Countermeasure

To study the effect of experimental countermeasures, it is necessary to have reliable data representing accident experience before, during, and after the period under examination. Evaluation of any suspected change in accident frequency can best be done by relating the accident data obtained during and since the experimental patrol period to past accident experience—preferably accident experience distributed over some reasonably lengthy period of time. Figure 1 shows for each week the number of Camp Lejeune military drivers involved in privately owned vehicle (POV) accidents (on-base and off-base combined per 10,000 men present for duty) for 1957 and nine months of 1958.[1]



CAMP LEJEUNE, N.C., MILITARY DRIVERS INVOLVED IN POV ACCIDENTS--OFF-BASE PER 10,000 MEN PRESENT FOR DUTY.

By converting accident frequency to a rate per 10,000 men present for duty, we account for fluctuations of base strength and, thus crudely, for exposure.

The effect of the measure was manifest only toward the latter half of the patrol period and for a period beyond its termination of about two and one-half months. However, the average effect during the ten weeks of the countermeasure (weeks 51 to 60 inclusive) was not significantly different from the corresponding period of the previous year or from the other prior periods of that year.

The lag in reaching maximum effectiveness might have been expected since the countermeasure was not announced publicly in advance to the military population at Camp Lejeune, and since informal communication among marines relative to the existence of the special patrols necessarily requires some time to reach a large segment of the population.

The difference in accident rate between the average during the nine weeks after the countermeasure was terminated and the average for the pre-experimental period represents a reduction of 42 per cent in the accident rate.

[1]In this analysis, only those accidents are included in which: (1) a private motor vehicle was involved, which (2) was driven by a male military person who was (3) in an off-duty status. Minor parking lot accidents, backing accidents, etc., are excluded.

Before this observed change in the accident experience can be properly interpreted, two important questions must be answered:

(1) Is the drop in accident rate during the weeks 61-69 statistically significant?

(2) Is the change, if significant, due to the random car-stopping procedure?

The answer to the first question is yes. The difference is significant at the .2 per cent level.[2]

[2]The statistical analysis is outlined below:

1. Assume that the Poisson distribution is a reasonable approximation of the data.

2. Then the estimated mean may be used as an estimate of the variance.

3. The data for weeks 51-60 indicate that changes were taking place and statistical control was lacking. Also, it is known that Christmas and New Year leaves were in effect and might have distorted the measures of exposure. Therefore, this period was disregarded.

4. *Objective:* To determine whether the accident involvement rate during weeks 61-69 was lower than that during the other weeks (excluding weeks 51-60).

5. Let X = the number of military drivers involved in accidents during weeks 61-69.

P_x = thousands of man-months exposure during weeks 61-69

Y = the number of military drivers involved in accidents during the remaining weeks

P_y = thousands of man-months exposure during the remaining weeks

λ_x = accident involvement rate during weeks 61-69

λ_y = accident involvement rate during the remaining weeks

6. The null hypothesis is that: $\lambda_x - \lambda_y = 0$

The alternative hypothesis is that: $\lambda_x - \lambda_y < 0$

If we form the statistic:

$$Z = \frac{X/P_x - Y/P_y}{\sqrt{X/P_x^2 + Y/P_y^2}}$$

it can be shown that, under the null hypothesis, Z is approximately normally distributed with mean zero and variance 1. Therefore we may define a lower limit on Z obtained from the normal table, with a level of significance of say, 5 per cent, and accordingly give a rule for rejecting the null hypothesis.

Rule: Reject the null hypothesis if $Z < K_{.05}$ where $K_{.05}$ is obtained from the normal probability tables.

$X = 36$ $\qquad$ $Y = 501$

$P_x = 57.6$ $\qquad$ $P_y = 486.8$

$$Z = \frac{[36/57.6] - [501/486.8]}{\sqrt{[36/(57.6)^2] + [501/(486.8)^2]}} = -3.0$$

Since $K_{.05} = -1.6$ (for a single-tailed test), a Z value of -1.6 is required for significance at the 5 per cent level. In the present instance the Z value of -3.0 is considerably greater than that required to reject the hypothesis of no difference in accident involvement for the two periods under consideration, being significant at the .2 per cent level.

It still remains to be demonstrated that these changes in accident rates resulted from the introduction of the random patrols rather than from other concomitant variables. Following are the most important factors which are known to affect accident frequency, with a discussion of each. If these factors are discovered to be stable or substantially unchanged, then the inference is supported that the downward change in accident rate is due to the countermeasure.

1. Permanent transfer or temporary absence of substantial numbers of military drivers from the Camp Lejeune area.

Variation in the number of men present for duty is already reflected in the accident rates presented in Figure 1. It is inferred that the number of potential car drivers is closely related to these numbers. Those who are *not* present for duty may be sick, detached elsewhere for temporary duty, on leave, on maneuvers, etc., so that they are temporarily removed from the driving population. The patrol effort took place over the Christmas and New Year holidays, during which time it is the policy of Camp Lejeune authorities to allow a large proportion of their personnel to go on leave. In the present instance, approximately 40 per cent of the men were given leave over Christmas and a different 40 per cent over the New Year holidays. The leave periods extended from about a week before Christmas 1957 to January 6-7, 1958. There is no simple way to ascertain what proportion of the 40 per cent left the immediate area and what proportion remained nor what proportion drove private automobiles and what proportion did not.

Since the holiday leave period began prior to Christmas and ended a week after New Year's Day, and since the accident rates continued at a lower level since the latter date, it may be surmised that an exposure-reducing effect in operation (if any) would have terminated with the end of the holiday period. At this time one might then expect an increase in the rates. This is seen in Figure 1 not to be the case.

2. Changes in the number of cars available to be driven by the driving population at Camp Lejeune.

The number of private automobile registrations before, during, and since the patrol period remained virtually unchanged. The Provost Marshal reports that the number is about constant, since there is approximately an equal number of new registrations each month and attrition (due to transfers) of former registrees.

3. Reduction in amount of driving (exposure to accident hazards), assuming no change in 1 or 2 above.

This information is simply not available. Presumably there would be *more* driving if anything, both on long leave trips and also in the vicinity of the base by men on leave who have their families with them. In the absence of this information, it has been assumed that driving exposure is closely related to the number of men present for duty (see 1 above).

4. Improvements in the driving environment through traffic engineering, i.e., the modification of physical aspects of roads, installation of traffic lights, etc.

No major highway engineering improvements were completed during the 10-week test period, or during the post-test period studied.

5. Activities of state or military authorities judged to have some effect on accident incidence which may have been introduced, altered, discontinued, etc.

Prior to the institution of the patrols, conferences were held with the Provost Marshal's staff to determine if any major changes were anticipated in operating procedures, intensification of regular patrols, or other activities designed to have a beneficial effect on accident frequency. The activities presumed to affect rate were the following:

a. Coffee bars were established on the nights prior to return dates from Christmas and New Year holiday leaves.

b. Wrecked automobiles were exhibited on base prior to the Christmas and New Year holidays as reminders of holiday driver hazards.

c. Saturation patrons (in addition to car-stopping patrols) were allocated to high accident areas (on the basis of previous Dunlap and Associates, Inc., research at Camp Lejeune) on the afternoon prior to, and on the day and night of the holiday, as well as the night prior to return dates. These patrols included both North Carolina state police and Camp Lejeune military police.

d. Marines were given verbal and printed admonitions for safe driving which are usually employed at military bases prior to holidays.

Effects of these measures, if any, would probably be mostly limited to the three-week period which includes the two holidays (the first three weeks of the random patrols). However, the major reduction in accident experience occurred in March and April 1958 following the 10-week patrol period (see Figure 1).

6. Changes in accident reporting procedures.

No changes in accident reporting procedures were instituted during the period of the countermeasure, nor since its conclusion. It is obvious that such a change in the criteria for "reportable" accidents could have resulted in a spurious reduction in accident frequency.

All the activities which could have affected the accident rate occurred during the countermeasure period itself, a period that showed no change.

Countermeasure Cost versus Countermeasure Effectiveness

By comparing mean weekly accident experience prior to the countermeasure with that in the nine-week period after its termination, it can be said that roughly 33 fewer military drivers were involved in accidents, than would have been expected on the basis of previous experience.

The average dollar cost to the Government for Navy and Marine Corps military personnel involved in motor vehicle accidents has been estimated at $3,754 each. Thus, a crude estimate of the savings to the Government is of the order of $124,000 ($3,754 x 33). A *precise* statement of dollar savings is beyond the scope of this investigation, but the important point to emphasize is that the apparent savings from this countermeasure were substantial.

No computations have been made of the estimated cost of the countermeasure for the 10-week patrol period. This might include such factors as the gasoline required for the patrol vehicles, the pay rate of the men involved, etc., but these costs are clearly trivial in comparison with the benefits derived from the countermeasure.

Human Factors in Highway Safety

by T. W. Forbes

Recently two intelligent, well intentioned, scientifically trained people independently voiced a very common point of view in discussing highways and driving. This point of view was that certain tests of driver fitness, knowledge and ability were probably desirable for most people. But they, themselves, could drive perfectly well without measuring up to all the knowledge of regulations and operating procedures, eyesight requirements and the like.

The speaker sympathizes with another person who just didn't like to wear his glasses and felt it an injustice that he was required to do so after failing the usual eye test (in most states 20/40 vision). However, let us look at what this attitude of many people implies and let us look at the driving task in today's and tomorrow's traffic.

We are rapidly acquiring a vast new interstate network of freeways which will bring all the advantages of more efficient, higher volume, relatively safer automobile traffic. The record of the controlled access, grade separated, divided highways shows that they are safer than those without such design features. Unfortunately, however, accidents still occur marring the efficient flow of traffic and causing human and economic losses.

Both on the new and on older highways the increased volume and pace of traffic and, in fact the more efficient and reliable performance of vehicles, make driver reactions more important and more critical. The driving public has done amazingly well in learning to operate vehicles and in adapting to new developments. However, it is important that all should realize that the task of driving a vehicle in modern traffic is not a simple one.

Perceptions, Judgments and Responses

In analyzing the driver's task, we find that perception of rapidly changing situations, judgments based on these perceptions plus background knowledge, and responses adequate for each situation are the essentials. The judgments made by the driver are based upon information about the highway situation and about possible hazards which may be so well learned that it is automatically rather than consciously used. Such information is nonetheless very vital.

I should like to suggest here that two kinds of specific, factual information affect very importantly (1) the difficulty of the driver's task and (2) the accuracy and effectiveness with which he responds in driving modern highways. These two kinds of information are: (1) what the driver does and doesn't know about the best procedures for operating the vehicle on modern highways and (2) what the highway designer and traffic engineer knows (and applies) about human limitations and operator abilities. Even though technical engineering personnel may not be able to delve into human factor research, specialists in this area can obtain and supply information to them if given an opportunity.

Knowledge, Motivation and Alertness

In addition to the immediate response of the driver to a situation on the highway, his background knowledge and his attitudes and motivations make a great difference in his reaction. Much research has been done but much more is needed on these various phases.

Strict enforcement, of course, is one way of motivating drivers to obey traffic laws and regulations. And, undoubtedly, we shall always need some such motivation to keep even the most well-meaning of us from slipping into driving behavior which may be dangerous at times. Enforcement efforts, too, will be most effective if drivers understand why certain operating procedures and regulations are safer than others.

Knowledge about hazards in itself is of great importance in determining attitudes and motivations. The alertness a driver maintains may also depend, at least partly, on how strongly he is aware of its necessity and his knowledge about how to maintain it. We need more human factor research of the psychological and sociological type to find out how different groups of drivers, safety organizations and others, affect each other.

Psychological research on high school driver attitudes and on attitudes of driver violators has been conducted in Colorado, California, Michigan and elsewhere. Sociological studies underway in Michigan* should also help to understand and improve the relationships between the public and enforcement personnel and procedures.

Personality Factors

Attitudes, emotional and other response habits, "aggressive" versus "passive" behavior and many other characteristics are often included under personality factors. The importance of these, undoubtedly, is great and this is a field of study in itself.

Here again, items of specific knowledge and their use in education and learning processes can influence development of personality responses also.

Presented at the Annual Virginia Highway Conference; Lexington, Virginia; October 30, 1959.

*Under the Highway Traffic Safety Center and Department of Sociology and Anthropology, Michigan State University.

Drivers Don't Know What We Think They Know

We find evidence occurring every so often which shows definitely that most drivers do not know as much as we think they know about driving. At the First International Skid Prevention Conference, it was pointed out that most drivers do not understand the various factors responsible for skidding nor how to avoid these or to regain control when in a skid. Following this conference, demonstrations of skidding and skid prevention techniques were carried out by the Winter Driving Hazards Committee of the National Safety Council last year. Certain driver education instructors who participated in this demonstration gave us enthusiastic reports on the information made available. Thus technical information brought together at this very fine conference was put into immediate, practical use and the need for it was confirmed by its enthusiastic reception.

As another example, adult drivers have behaved in such a way as to show basic ignorance of speed and distance relationships on high speed highways and of driver judgment time requirements. In one case on a high speed freeway, a driver and his whole family passed his off ramp at an interchange, stopped in the fast lane and backed up. Around a curve at just that time came a loaded semi-trailer being passed by a loaded bus. No one in the car survived.

In another case on another high speed highway, a woman stopped in the only open travel lane beside a minor repair job and was killed by a truck which tried to miss her but couldn't.

From day to day new examples of this lack of knowledge of critical items of information are demonstrated by driver behaviors. Large scale intensive accident analysis studies underway in the East and Midwest undoubtedly will bring out other illustrations of combinations of accident causing factors not understood by motorists.

The Human Engineering or Engineering Psychology Approach

The knowledge which is effective needs to be specific, as was the case on human and physical factors affecting skidding. How can we obtain such specific knowledge both for traffic people and for drivers? One very effective method is the "human engineering" or "engineering psychology" approach as it has been called. This approach applies research procedures from the human factor sciences, especially experimental psychology, to solution of the man-machine-environment problem. This technique has proved very helpful in connection with military, industrial, and also highway problems. In a word, it consists of measuring the effects of different factors on the speed and accuracy of perception, judgment, and response of the individual required in performing different tasks. It is possible to analyze the various components of the task and to measure experimentally effects of different factors on the human reaction required for successful operation.

As an example from the field of aviation, certain altitude errors of 1,000 feet or 10,000 feet were blamed on "cockpit hypnosis" until engineering psychology studies showed that there is a very common error of reading clock dial instruments. It is very likely that we will be able to account for certain highway accidents which are now blamed on "highway hypnosis" or just "carelessness" when we take the human engineering approach and carry out adequate human factors research. Already we have a great deal of basic information from background sciences, a small portion of which has been put together to make it available to highway design and traffic engineers.[2]

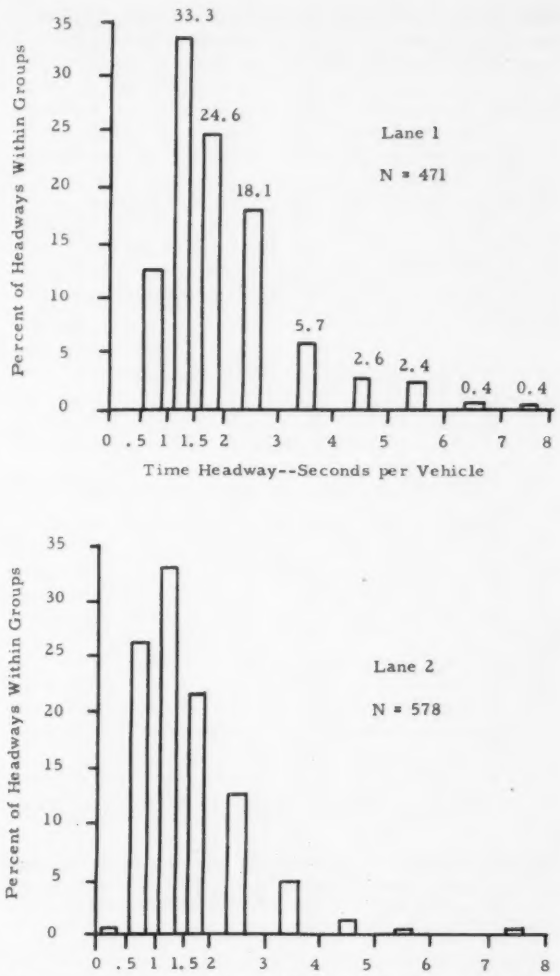


Figure 1. Distribution of individual time headways, Ford expressway, Detroit, 7:15-7:30 A.M., 3-27-58.

An Example of A Basic Problem

Modern automobiles and improved highways, together with the convenience of automotive transportation, have brought increasing traffic loads and speeds on our traffic arteries. The pressure of traffic on many of our urban expressways leads drivers to operate their vehicles at very close time spacings or headways and, in fact, the efficiency of traffic flow now requires such close operation.

Figure 1 shows individual headways of vehicles measured in Detroit* which confirm similar measurements elsewhere.

*For a discussion of these data in relation to average headways in a report entitled "Traffic Characteristics and Phenomena On High Density Controlled Access Facilities" by Adolf May, Highway Traffic Safety Center, Michigan State University, see Forbes, T. W., "Human Factors in Highway Design, Operation and Safety Problems." Human Factors, 1959. In press.

Note that a considerable proportion of drivers were operating at slightly over 0.5 seconds headway. This time interval is less than the minimum for an emergency stop when the operator is concentrating only on responding to a signal by stepping on the brake. (The time headway was measured from center to center of the vehicles. Therefore, at 50 mph the length of the vehicle is one-half of the distance spacing of about 37 feet. Hence, drivers were actually operating at considerably less than 0.5 seconds in such a case.) Thus we see that the time required for perception of a situation, evaluation and judgment of the best action, and response of the driver has become a very critical quantity in highway driving just as it has in flying high speed airplanes.

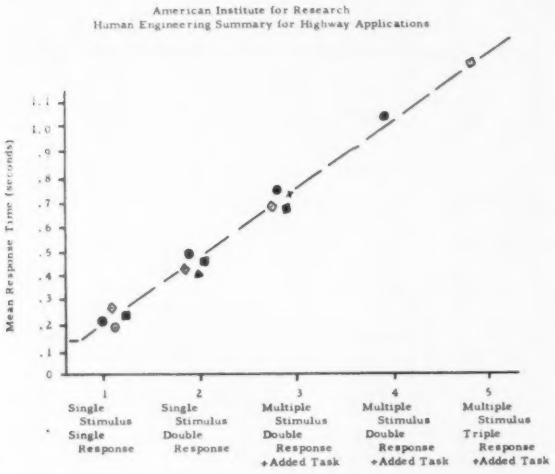


Figure 2. Increase of mean response time with increasing tasks and responses. Data from six studies of foot and leg responses on brake and accelerator; one of tracking with control stick. See reference 2, p. 17.

Clearly, then, the driver in modern traffic must realize the necessity for being continually on the alert. But how can the design engineer and the traffic engineer help the situation? Two figures from the handbook[2] will suggest an answer. Figure 2 shows that when various studies of perception and response were analyzed and response time was plotted against number of stimuli and of responses, the required response time was increased and a systematic straight line relationship resulted. Figure 3 represents a similar analysis of published research results on slightly more complex responses. It shows that as the complexity of the task increased the required response time also increased. In addition, the chance of making an error also increases.[2]

Therefore, the designer and traffic engineer can reduce the difficulty of the driver's task by keeping the components of his task to a minimum number at any one place on the highway or in connection with any one maneuver which is required by regulations, signing, design of ramps, interchanges, and the like. Automobile controls already have been greatly simplified and possibly future designs may achieve further operating simplification.

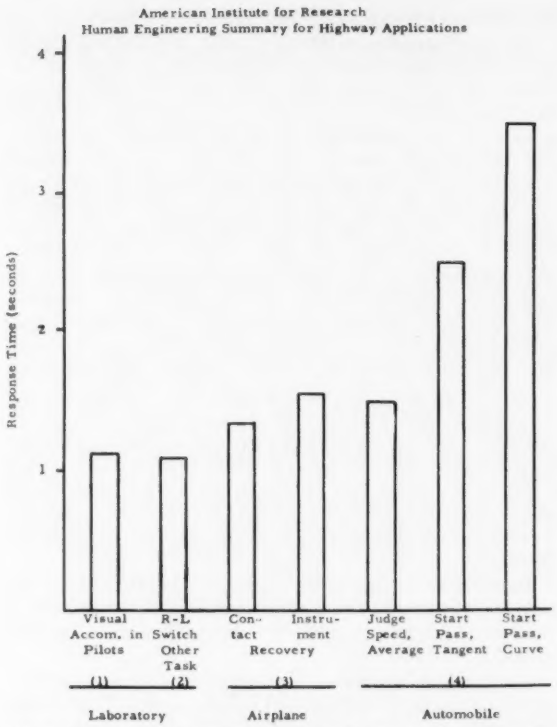


Figure 3. Increase of response time with increased complexity and difficulty of judgment task. See reference 2, p. 23.

Task Analyzed from Driver's Viewpoint

In order to successfully reduce the complexity of the driver's task by the human engineering approach, however, we must analyze the task as the ordinary driver experiences it and not as the engineer or traffic expert sees it. For instance: most traffic engineers in designing signs are quite familiar with the highway system and the location of cities and towns. Therefore, a sign which appears simple to them often proves very misleading to the motorist who needs the signs the most, i.e., the strange driver. As an illustration of this, a recent study on supposedly well signed freeways[3] showed that a very sizeable proportion of the drivers turning off on various interchange ramps were not where they thought they were nor where they wanted to be. Engineering psychology long ago contributed sign legibility data which make it possible to design signs which can be read by 85 per cent of the drivers[4] at required distances for given design speeds. Now we need to apply this approach further to develop procedures which will give the stranger information he needs most simply and effectively (and this means from his point of view).

Less Ambiguous Symbols

One example of improving and simplifying the method of giving control information to the driver is represented by an engineering psychology study of lane control symbols carried on in Michigan.[5] In the case of individual lane control on bridges or urban expressways there is a need for distinguishing between the desired meaning "don't use this lane" and the meaning of the red bullseye signal which

is "stop here and wait for the green." If drivers do this when it is desired to clear a lane for an ambulance or a tow truck, it defeats the purpose of the lane control signal, and it may even cause an additional accident.

For lane control, the combination of a red-X and a green-arrow-pointing-up showed less ambiguity than the standard bullseye signals and than several other combinations of signals which were tried out on the observers. This engineering psychology study, therefore, showed the advantage of the red-X which is now in use in Michigan.

Drowsiness and Sleep

Sleep is a fundamental feature of human behavior but when it appears behind the wheel it almost always causes trouble. An experimental study of drowsiness behind the wheel[6] showed that when drivers are deprived of sleep about as much as when starting on a vacation after a busy schedule, drowsing behind the wheel occurred within two to three hours. This occurred both on freeways and on older types of state highways. And these people actually went to sleep while they were being observed and required to report concerning the highway and their operation of the vehicle. Such a procedure might be expected to prevent drowsiness, but it did not with these sleep-deprived drivers. Here is evidence, then, that driver drowsiness is not necessarily caused by the excellence of the design of our new freeways as some have charged.

There is considerable evidence from turnpike accident records[7, 8] and from the characteristics of one car accidents on open highways of all kinds, that drowsiness is a very important and dangerous human reaction while driving.

Introducing Hazards Not the Answer

What, then, should we do about this as officials, designers, traffic engineers, and traffic safety people? Most of the drivers most of the time on the highways are awake and alert. It hardly makes sense to introduce additional hazards for the majority on the theory that it might awaken the relatively few sleepy drivers. Introducing bumps and curves and the like have been suggested for this purpose. Actually, this would be just the wrong approach to take.

We are dealing with a well known characteristic of human behavior, i.e., there is a large safety factor allowing the individual to compensate for influences tending to reduce his efficiency. However, even before actual drowsing the studies showed gradual reduction of efficiency, short periods of reduced sensitivity and slowed activity and, finally, actual periods of dozing. That means slowed and less accurate driving responses in these borderline periods. Therefore, making the driving task more difficult is not desirable.

Traditional Attitude Must Change

Erratic speed and more than ordinary weaving to the edge of the lane or beyond was characteristic of the critical approach of sleep. Some attempts have been made by turnpike patrols to stop and warn motorists on the basis of these symptoms, but this can only help in a relatively few cases. Drivers must realize the need for getting enough sleep before trips, eating lightly, and making rest stops, and otherwise keeping in good physical and mental driving condition.

A study of near accident reports[9] showed that some individuals thought they could fight sleep successfully, but found they could not. These particular individuals were just lucky that they woke up in time and were able to survive. One of them dozed off while overtaking another vehicle on a two-lane highway and awoke just in the nick of time on the left hand shoulder after he had passed the vehicle ahead. Another returning from vacation with his family in the car found himself on the right hand shoulder approaching a small stream, and in his semi-conscious state tried to jump the stream by stepping on the gas.

All of us as drivers must get over the traditional idea that anybody can drive an automobile any time, no matter what his condition. The studies referred to above show that quick perception, good judgments and alert responses are now just as important for survival on our high speed highways as they are in areas where they may have been thought previously to be more important.

More Adequate Specific Information Needed

In conclusion, highway and safety research must receive continuing, increased support to make possible more adequate studies on a large enough scale to convince the driving public of the importance of specific knowledge of best operating procedures and of maintaining most effective personal condition and driving behavior. Furthermore, highway officials, designers, traffic engineers and safety experts must also recognize the importance of such specific, scientific information. In this way will the public come to take seriously the information which is of so much importance. Then, perhaps, there will be less tendency for drivers to feel that the requirements of knowledge and fitness need to be high for others but not for oneself.

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Variability of Fixed-Point Speed Measurements

by Robert P. Shumate and Richard F. Crowther

THE PROBLEM

For many years a large percentage of accident prevention activity has been concentrated on speed. Safety campaigns aimed at reducing traffic accidents, almost without exception, have emphasized speed in relation to accidents. A large proportion of day-to-day activity devoted to control and prevention of accidents is directed at inducing people to drive slower.

During the past two decades much has been written about speed and its probable relationship to traffic accidents. Unfortunately, the great bulk of published material relating to vehicle speeds has been prepared specifically for popular consumption, and contains little information of scientific value. Few authoritative materials have been published that deal with the characteristics of speed behavior in general. Practically no one has explored in depth the relative effectiveness of various methods and procedures intended to influence speed behavior.

Highway safety authorities postulate a causal relationship between speed and accidents. Several attempts have been made to verify and quantify this relationship, with differing degrees of success. Such a causal relationship has not as yet been established with any degree of certainty, and before it can be affirmed or refuted, many questions pertaining to speed behavior need answering.

Speed behavior in a traffic stream is most commonly measured through the use of the fixed-point measuring techniques. This method involves the use of one of several mechanical or electronic speed-measuring devices currently available. From the speeds themselves, or from various computed statistics, certain inferences can be drawn about speed in the traffic stream under study.

This method holds considerable appeal for the traffic engineer and others who wish to evaluate the effects of changes in geometric design, signing, or increased enforcement. It has obvious values in research requiring an evaluation of speeds before and after modification of a single variable. The method requires a minimum capital investment in equipment, and large amounts of data may be collected at a low per-unit cost as compared with other methods.

While the values of fixed-point speed-measuring methods are obvious, they leave the investigator open to many and subtle pitfalls. Vehicle speeds occur within a space-time continuum bounded by an almost infinite number of dimensions, many of which directly affect speeds observed at given points within the continuum. The problem of obtaining samples of vehicle speeds at a fixed point, which will adequately depict the nature of the real world being studied, is complex. The more precise the measurement being attempted, as in the case of attempting to determine slight but real changes in speeds brought on by enforcement activity, the greater the sampling problem.

A detailed inquiry into the development of sampling methods in speed measurements is necessary before experimental study of speed behavior can be undertaken on any large scale. The nature of the real world and the theoretical considerations underlying sampling design suggest that existing sampling techniques for fixed-point speed measuring are inadequate for refined experimental work.

DEVELOPMENT OF THE STUDY

Nature of the Report

This paper is an interim report of studies dealing specifically with the development of sampling methods for studying vehicle speeds, using fixed-point methods of measurement. Because it is an interim report, the conclusions presented are necessarily tentative and subject to modification as more data become available.

The decision to publish an interim report was prompted by the amount of work currently being directed at speed measurements. It was felt that even the initial data and conclusions would be valuable to workers now engaged in planning experimental work in this area.

Historical Background

On October 1, 1958, the Wisconsin State Patrol placed several sections of rural state and federal highways under concentrated enforcement patrol. Prior to this time these highways had received only a minimum of enforcement attention, mostly from county police forces. The level of enforcement designated for this highway network by the state patrol was uniform, one enforcement unit for each 15 miles of highway during two shifts (18 hours each day). The enforcement levels have been held constant from October 1, 1958, to the present.

Prior to the placement of additional patrol units on these highways, plans were drawn up for the study of long-range behavioral changes in the traffic stream after increased enforcement was applied. Of primary interest were evaluations of the type and degree of changes in speed behavior.

In September 1958, one month prior to the assignment of enforcement units to the test network of highways, a series of samples was taken at five separate points on the network. Several samples were taken at each location for different combinations of hours within days, and different days of the week. No sample period was less than four hours duration and no sample contained less than 200 vehicles. All samples were taken in clear weather with dry road surface, using methods described in the section of this report entitled "Field Procedures."

Sampling Problems

From the outset it was apparent that the sampling problems involved were exceptionally complex. When evaluation of the data collected at the five testing locations was completed in October 1958, it was concluded that before it would be possible to isolate and measure changes brought about by an artificially induced variable, more refined sampling methods would be required.

Initial evaluation of the samples gathered during September revealed statistically significant differences between samples taken at the same location under identical weather conditions but on different days of the week, or at different hours during the day. No readily apparent systematic factors could be related to these variations, other than the time

at which the samples were taken. Not only did the samples tested show statistically significant differences in regard to mean, variance, and proportion over the speed limit, using the *t* and *Chi* square tests, but the absolute value of the differences was sufficiently large to make the assignment of all but extremely large changes produced by the controlled variable impossible.

As a result of this initial experience, it was decided to undertake a study of vehicle speeds over an extended period under conditions as nearly normal as possible. The purpose of this study was to develop a theoretical model specifying required sampling design and then to test it against the real world by empirical methods. The development of the theoretical model and the testing by empirical methods have proceeded concurrently, with modifications of both being made as the information available at a given point in time dictated.

For this study, a highway location that met certain minimal requirements was necessary:

1. Marginal development, along the highway, both at the measuring point and for at least two miles in either direction, should be at a minimum.

2. Enforcement activity, both present and past, must have been at a minimum.

3. Traffic volumes should be sufficiently great to assure an adequate number of observations and range of volume levels, but not great enough to produce congestion.

4. Speed limits should be the maximum permitted for rural highways throughout the state.

5. Highway design should be such as to minimize its effect upon speed behavior.

In November 1958, a site was selected on U. S. Highway 14, between Darien and Walworth, that approximated the desired specifications. The highway at this juncture consists of two eleven-foot driving lanes with four-foot, gravel-packed shoulders. The surface is travel-worn asphalt in good condition. Road alignment approaching the sampling site is straight for 1.1 miles to the north and eight miles to the south. The grade within one mile in either direction is negligible. The marginal development consists of scattered farms, and the legal speed limit is 65 m.p.h. in the daytime and 55 m.p.h. at night. The nearest zones requiring reduced speed are four miles to the north and six miles to the south.

Sampling was begun at this location during the first week in November. A continuous sample of vehicle speeds was taken for 16 hours each day, from 7:00 a.m. to 11:00 p.m. Monday through Friday. This procedure was repeated for each subsequent month, with the exception of February when weather conditions throughout the month made sampling impossible. This report will deal with data collected up to and including the month of May. Present plans call for continuing this procedure each month through November 1959, at which time a full year of representative samples will be available for evaluation.

DATA COLLECTION AND PROCESSING

Field Procedures

All measurements of vehicle speeds are made with an Electromatic Radar Speed Meter, which consists of a sensing unit, a standard indicating meter calibrated in miles per hour, and a 12-volt power source. The sensing unit is located adjacent to the highway in a specially constructed mailbox with a 12-volt battery concealed in the base as the power supply. The observer recording the data is housed in a station wagon placed well back in a farmyard concealed from the view of drivers passing along the highway. The indicating meter is connected to the sensing unit by means of a 500-foot cord. The entire unit is calibrated by a standard calibrating tuning fork before each day's sample, again after eight hours of operation, and at the completion of each day's sample.

Speeds are read from the indicating meter by an observer and recorded in five-mile-per-hour intervals on a specially prepared recording sheet. Samples are recorded by direction of travel and by hour to facilitate study of specific periods of the day. Vehicles are separated into three classes —passenger cars, light trucks, and heavy trucks. Unusual traffic units, such as vehicles pulling house trailers, road machinery, etc., are not included in the general sample but are noted separately.

Periodic samples of the actual speeds of individual vehicles are taken at irregular intervals, usually covering all vehicles that pass in a two-hour period. These samples are used primarily for the purpose of analyzing the distribution of speeds for tests of skewness and kurtosis. Periodic tests are carried out for the purpose of detecting sample bias by driving a vehicle with a calibrated speedometer through the sensing unit at a known speed. Normally six northbound and six southbound tests are conducted. No bias has been detected in either direction.

The observers used are off-duty highway patrolmen with extensive experience in the use of radar for enforcement purposes. Each observer spends a minimum of two hours with the field supervisor standardizing his reading techniques before actually making observations on his own. The reading accuracy of each observer is checked at periodic intervals by having the field supervisor take a series of readings from the meter while seated directly behind the observer. The reading error has been determined to be within plus or minus one m.p.h.

The speeds of all vehicles are measured, regardless of whether or not they are in free flow. This procedure was adopted since we are interested in studying the effects of volume on vehicle speeds, as well as other factors. To avoid repetition throughout the report it should be noted here that, unless otherwise indicated, all comparisons are standardized as to weather and road conditions. All samples used in the report were gathered during fair weather with the road surface dry.

METHODS OF INTERPRETATION

If we wish to answer questions such as "Have driver speeds changed as a result of increased enforcement activity?" it is necessary first to determine the extent to which speeds will vary under normal conditions from one time period to another. It is reasonable to assume that driver speeds change minute by minute, from location to location, and from driver to driver, even under apparently similar conditions. In addition we know that no two sets of measuring instruments and observers produce identical results. The most carefully conducted examination of driver speeds will reveal some change from one time to the next, even under the best of circumstances.

If such changes are completely random in the sense that some changes increase while other changes decrease speed, we would have little difficulty since, with large enough samples taken over a long enough period of time, these random differences would disappear. The problem we face here is one of determining whether the differences in

speed behavior between any two arbitrarily selected time periods are:

1. Large enough to produce serious errors if we attempt to determine the effect of an introduced variable such as enforcement.

2. Systematic with regard to various convenient time intervals such as hours, days, or months.

The answers to questions such as these may best be found through statistical reasoning. We are compelled to answer, for example, the question whether the hourly differences between mean speeds computed from our data vary randomly, or whether they show a consistency in their variation. The techniques used for such an inquiry are called Analysis of Variance and are too lengthy and complex to discuss here. However, we may generalize briefly concerning the techniques used in order to give the reader some understanding of how the conclusions were reached.

The data from which hourly average speeds are computed at a particular highway location may be thought of as a sample of the speeds of all cars which travel that location day after day, month after month, year after year. Since the hourly sample represents only a very small number of the total observations that could be made, we would not expect that its average, for example, would be exactly the same as an average computed from all the vehicles that ever have or ever will pass that particular point.

Statistical theory, and indeed intuitive reasoning, tells us that even though the average of a sample such as this will not be identical with the average of a larger set of data from which the sample is drawn, it will not be far different and will approach the true average as the sample size is increased. Another and perhaps more important consideration is that if repeated small samples are drawn from the traffic stream, the mean of some will be above the true mean and an equivalent number below, if the error in sampling is *truly random*. By random we mean equally likely to happen in any of the possible ways. In using this definition we take some liberties with randomness as used in the usual mathematical sense, but for purposes of a simplified discussion the definition will suffice to convey the general principles involved.

This latter concept is important since it forms the basis for analyzing our problem. Let us assume, for example, that we have one hundred hourly samples of vehicle speeds taken at the same location on a given highway. If the differences between these samples brought about by differences between drivers, instrument error, and the like are random, then we would expect the differences between all sample means and the true mean of speeds at that point on the highway to be close to zero. This is another way of saying that if the differences are equally likely to produce higher or lower readings, the differences will average each other out.

By expanding this simple concept it is possible to determine rather precisely whether differences observed in the average speed of hourly samples are real or due merely to chance factors. By computing the total amount of variation of the hourly samples from the estimated true mean we may reach decisions as to whether differences between hourly time periods are real or due to chance. The further the observed variation departs from zero the greater the likelihood that the differences are real, produced by some combination of causal factors. The same reasoning may be applied to periods of a day, month, or week by treating the interval to be tested as the sampling period.

Suppose we wish to find the answer to a problem such as this. We determine that the differences between hourly mean speeds are real and cannot be accounted for by chance alone. Taking these differences into consideration, if we have three different days with 10 hourly samples each, are the differences between daily average speeds also real? Such a question may be answered satisfactorily by taking into account the amount of difference already found between hours.

The statistical techniques for accomplishing this are beyond the scope of a simplified description such as this. However it will suffice to say that differences between hours, days, and months can be examined at the same time, with the differences between the other items in the problem being used as a kind of corrective device.

One further concept should be clarified. If we do find differences between various factors such as a group of hourly mean speeds, at what point do we assert them as material differences? In any set of samples it is highly unlikely that we would ever find that the differences were *perfectly random*. Since perfect randomness would produce a variation which would come close to zero we must decide how far we can permit the variation to depart from zero before we will accept the difference as a real one.

Probability theory provides our method of making decisions in this case. By utilizing statistical measures we may determine for any magnitude of variation the probability of its occurring. We normally state this in the form of a decimal fraction, such as .01. In more common language it means that there is one chance in a hundred that a variation as large or larger than the one observed would occur by accident, or that the "odds" are 99 to one that the differences are real.

A word of caution is necessary at this point. While techniques such as those described here provide the necessary evidence of where real differences occur, they do not in and of themselves assign the cause. Causation must be determined by a careful assessment of all factors at work in the real world.

We have related speed changes to time intervals, hours, days, and months. The fact that real differences are found among these time intervals does not of course specify causation except in the most general sense. The fact that speed changes are related to the time interval during which they were gathered is of singular importance, even though it does not specify the many factors which produce these differences.

RESULTS

Several different sets of data were tested to determine where real differences appeared. The first four sets were as follows:

Set 1. Passenger cars—Days 8:00 a.m. - 4:00 p.m. Total 240 hours.

Set 2. Passenger cars—Nights 5:00 p.m. - 11:00 p.m. Total 180 hours.

Set 3. Trucks—Days 8:00 a.m. - 4:00 p.m. Total 240 hours.

Set 4. Trucks—Nights 5:00 p.m. - 11:00 p.m. Total 180 hours.

For each set the following hypotheses were tested:

1. That the variation between all hours, allowing for variation between months and days, was not large enough to be significant.

2. That the variation between all days, allowing for

variation between months and hours, was not large enough to be significant.

3. That the variation between all months, allowing for variation between hours and days, was not large enough to be significant.

Exhibit 1—Summary of Differences in Mean Speeds

Data Set	1 Test	Probability That Difference Is Real	
1. Cars (Day)	Hourly Mean Speed Different	.01	99 - 1
	Days Mean Speed Different	.01	99 - 1
	Monthly Mean Speed Different	.01	99 - 1
2. Cars (Night)	Hourly Mean Speed Different	.01	99 - 1
	Daily Mean Speed Different	.01	99 - 1
	Monthly Mean Speed Different	.01	99 - 1
3. Trucks (Day)	Hourly Mean Speed Different	.05	19 - 1
	Daily Mean Speed Different	.05	19 - 1
	Monthly Mean Speed Different	.01	99 - 1
4. Trucks (Night)	Hourly Mean Speed Different	.01	99 - 1
	Daily Mean Speed Different	.01	99 - 1
	Monthly Mean Speed Different	.01	99 - 1

From an examination of the data in Exhibit 1 we may conclude that, with the possible exception of the daily and hourly means for trucks in the daytime, the differences in mean speeds are larger than can be accounted for by chance. In other words the difference in hourly mean speeds, even after we remove any possible effect produced by differences between days and months, is too great to be the result of chance fluctuation. We may say the same thing about daily mean speeds and monthly mean speeds.

At the same time, the data for the sets described above were processes to additional sets of data for cars. These consisted of the following:

Set 4. Passenger Cars 8:00 a.m. - 4:00 p.m. Monday, Tuesday, Thursday, Friday.

Set 5. Passenger Cars 8:00 a.m. - 4:00 p.m. Tuesday, Thursday.

The purpose of these tests was to determine whether there was any combination of days for which some of the differences previously determined were not material. The results are summarized in Exhibit 2.

Exhibit 2—Summary of Differences in Mean Speeds

Data Set	Test	Probability Difference Is Real	
5. Cars (Day)	Hourly Mean Speed Different	Not Significant	
	Daily Mean Speed Different	.01	99 - 1
	Monthly Mean Speed Different	.01	99 - 1
6. Cars (Day)	Hourly Mean Speed Different	.05	19 - 1
	Daily Mean Speed Different	Not Significant	
	Monthly Mean Speed Different	.01	99 - 1

The data contained in Exhibit 2 suggests the following conclusions:

1. The difference in monthly mean speeds are large enough to be material in all cases.

2. The differences between Monday, Tuesday, Thursday, and Friday mean speeds are real and material.

3. The differences between hourly mean speeds are not material for those days if allowance is made for differences arising from changing days of the week and month.

4. The variation in daily mean speed between Tuesday and Thursday is not material if allowance is made for differences arising from changing days of the week and month.

It should be noted that the conclusions reached for Set 5 differ substantially from those reached using Set 1. We attribute this difference to the fact that Set 1 contained a Wednesday sample taken under abnormal weather conditions. It is quite possible that the weather effect on the Wednesday samples was sufficient to override the effect of the normal days included in the sample, and thus to produce the significant hourly effect apparent in Set 1. This point will be explored more fully when complete data are available.

IMPLICATIONS AND FUTURE ACTION

The study thus far deals with an approach to the problem of sampling and measurement of speed data using fixed-point techniques. The most important conclusion is that the variation within samples taken at the same location under the same weather conditions, etc., but at different periods of time, cannot be used to interpret the significance of a difference in the means of samples. For instance, samples taken at the same location a month or year apart will tend to be unreliable as a measure of changes produced by a newly introduced variable.

The quality of sampling can be improved by matching hours of the day, days of the week, and months of the year, as well as location. In the collection of fixed-point speed samples there appear to be no great difficulties in matching sampling times in terms of hour, day, and month or in terms of weather conditions and location. Clearly samples should be collected within fixed time intervals, and not solely with the objective of totaling up some minimum satisfactory number of observations. The danger in relying upon a minimum "satisfactory" number of observations alone is that, as the sample size grows, the differences in sample mean speeds reflect not only true changes in speed behavior over the interval between sampling periods, but also the changes in mean speed arising from differences in the hourly, daily, and monthly variables.

Some implications of these conclusions are disturbing. With such variability inherent in the data, fixed-point speed measurements have limited value as a reliable research device, unless corrective measures can be utilized. Unfortunately this question cannot be answered satisfactorily until complete data for this project are available. Two things may be expected to be accomplished when all the data are available:

1. Limit within which true speed values may be expected to fall can be established, thus serving to specify the limits within which fixed-point measuring techniques can be used as a reliable research device.

2. Correction factors may be developed which can be used to eliminate the bias that occurs because of daily, hourly, and monthly variation.

From a study of the currently available data it would appear that both of these accomplishments can be realized. The importance of success in this aspect of our study, in relation to establishing more certain ways of measuring driving speeds, is great. It will have important ramifications for further refinements in sampling. And this is an essential step forward toward firmer conclusions concerning driving behavior, and the effects of environmental factors on it.

THE CHILD IN INJURY-PRODUCING AUTOMOBILE ACCIDENTS

A Preliminary Report

by John O. Moore and Robert Lilienfeld

ACKNOWLEDGMENTS

Automotive Crash Injury Research of Cornell University is sponsored by research contracts with the Office of the Surgeon General, Department of the Army, under recommendation by the Armed Forces Epidemiological Board, with supplemental grants from the National Institutes of Health, United States Public Health Service, and generous grants-in-aid from the Automobile Manufacturers Association. Data available to this research program are obtained by means of coordinated formal arrangements through state governments with the departments of public health, as well as from state medical societies and state police in seventeen states. There are eighty-five sample areas distributed through the seventeen states. From these sources come data from injury-producing and property damage automobile accidents on rural as well as urban streets and highways.

The ability of any academic research group to establish studies of this nature is a reflection of the collaboration and contribution of physicians, public health workers and investigating officers in the various states from which the data have been obtained. Without their dedication to the concepts and the needs of research, no such study as this would be possible.

INTRODUCTION

Never before in history has any nation been able to provide so many social and economic benefits to its individual citizens as present day America. The provision of these benefits is, to a very large degree, the result of our ability to move both people and the goods we make more rapidly through our advanced system of transportation and communication. There is no doubt that the outstanding characteristic of our method of living is its mobility. In truth, the common denominator of all citizens of our nation, other than the income tax, has become the passenger automobile.

In 1946 this nation had approximately 37 million passenger vehicles on its highways. By the end of 1958, the figure had risen to 62 million passenger vehicles. Addressing the National Safety Congress in Chicago the latter part of October, Mr. Bertram D. Tallamy, Federal Highway Administrator of the Bureau of Public Roads, released the Federal Government's official estimate that there will be 82 million cars on the highways by the end of 1966. Under the greatest construction program in the history of man—the Federal-Aid Highway Act of 1956—it is planned to add 41,000 miles of new highway of the most advanced design. Despite its cost, this will represent only 1.2 per cent of the total surface mileage in this country, and is expected to carry 20 per cent of the total volume of traffic when it is completed. Thus, we can anticipate our problem of exposure and congestion will become more acute with each passing year.

The common denominator of the transportation world has evolved from a pleasure car to an essential instrument of our entire pattern of living. Any appreciable curtailment or restriction of the right of the American citizen to use our transportation system could conceivably produce economic and social chaos.

With all the benefits which the passenger automobile has brought us and the pattern of living it has let us establish, it has also brought with it a dangerous by-product. This by-product should be classified as a mass traumatic disease which is producing pathological results for approximately 1,200,000 of our citizens *each* year. Evaluation of the data covering the year 1956, which were released in 1958 by the National Office of Vital Statistics of the U. S. Public Health Service, provides interesting information as to the importance of this mass disease as a cause of death in comparison with other disease entities.

When the 17 leading causes of death are ranked in order of the percentage of the total living population affected by these diseases, the highest incidence of fatal disease in the ages 5 through 34 is found to be accidental deaths. By separating other accidental deaths from all those attributed to accidents in motor vehicles, we observed that the modern passenger car is the third leading cause of death in ages 5 through 9, the second most frequent cause of death observed in the ages 10 through 14, the foremost cause of death in the ages 15 through 19 as well as 20 through 24. The motor vehicle moves back to the second most frequent cause of death in the 25 through 29 age group, the fourth ranking cause of death in the 30 through 34, as well as the 35 through 39 age group. Thus it may be safely said that in the ages 5 through 39, the passenger vehicle will be seen as one of the most likely items to produce death among our population.

This same rank in cause of death may be observed if the U. S. Public Health Service's data are examined from the point of view of the percentages of fatalities represented by the 17 causes of death. However, the true scope of the problem of trauma produced by the motor vehicle must not be evaluated by merely looking at data on fatalities. Data obtained by the National Health Survey, conducted by the U. S. Public Health Service and the Bureau of Census, give a true measure of the morbidity of both the total accident and the motor vehicle accident problem for the first time. In summary, this survey, accomplished at the request of the U. S. Congress, indicates that 50 million American citizens are injured in accidents each year to a degree requiring medical treatment, hospitalization, and/or loss of activity of at least one day or more. Motor vehicle accidents account for 10 per cent of the *non-fatal* injuries and for 43 per cent of the *fatalities* resulting from accidental causes.

Children in Automobile Accidents

As has been indicated above, children are not exempt from the toll of mortality and morbidity we presently pay for our superior mobility. Knowing this, many of us are anxious to provide special protection for them when we travel. To date, however, we have done little more than admonish them about playing with door handles or tampering with the controls. It is true that we buy special seats and cradles for small children, but we have no scientific evidence whatever as to whether these devices provide protection or actually increase danger of fatal or crippling injury in case of accident. Considering that successful research in so many areas of disease has had its beginnings in our desire to protect children—the control of diphtheria, typhoid fever and poliomyelitis are cases in point—it is surprising that so little is known about death and injury to children in automobile accidents where the proportions of accidental trauma are truly epidemic, and virtually uncontrolled. Information as to the causes and nature of children's injuries in automobile accidents may aid us in providing our children with improved protection against the hazards of future traffic accidents. It is with this consideration in mind that the following paper is presented.

DEFINITIONS AND PROCEDURES

(Table I)

In this particular study of injury patterns of children in automobile accidents, the population studied consisted of 14,520 automobile accidents in which at least one occupant of the vehicle was injured. There were 31,925 occupants exposed to the possibility of injury. The data contained in this particular study were confined to non-pedestrian automobile accidents on *rural or open highways.*

For the purposes of this paper, the "child" is defined as an individual from 1 month *through* 11 years of age. The "adolescent" is defined as an individual from 12 *through* 18 years of age. The "adult" definition refers to individuals over 18 years of age. The population contained 31,001 humans of known age involved in injury-producing rural highway accidents. In this preliminary paper, attempts were made to answer the following questions:

1. What is the proportion of children in the population under study?

2. Are there differences in the *frequency* of injury among children, adolescents and adults?

3. Are there differences in the *severity* of injury among children, adolescents and adults?

4. What patterns of injury, frequency and severity do children, adolescents and adults exhibit with respect to body areas?

5. For each age group, what influence does seated position have on the frequency and severity of injury?

6. Are there any indications as to factors possibly affecting any observed differences which might profitably be explored in future studies?

Attention should be drawn again to the limitations of the data forming the basis of this study: All cases concerned here were nonpedestrian accidents involving *passenger cars,* and all accidents examined occurred on rural roads or the open highway, as opposed to urban streets and roadways. The implications of this limitation will be discussed subsequently in this report.

OBSERVATIONS

Age Distribution (Tables IIA and IIB)

Roughly 9 per cent of the rural injury-producing accident population studied was composed of individuals defined as children (1 month through 11 years of age; about 16 per cent were adolescents (12 through 18 years inclusive); some 73 per cent were found to be adults (over 18 years old).

The general population of the United States comprises 23 per cent children, 10 per cent adolescents and 67 per cent adults. Thus, it appears that the rural injury-producing accident population differs from the general population in having markedly fewer children and somewhat more adolescents and adults.

Frequency of Injury (Table III)

The observed frequency of injury to children, as defined in this paper, was significantly ($P = .001$) less than that of adolescents and adults. Injury was seen among about 52 per cent of children, 71 per cent of adolescents, and 80 per cent of adults. Thus, roughly speaking, as occupant "age" increases in rural injury-producing accidents, so does the frequency of injury.

Severity of Injury (Table IV)

When the *injured* persons in each of the three age groups were compared, there was a marked difference in the *severity* of injury. Children sustained more minor injuries than either adolescents or adults, and fewer non-dangerous* or dangerous-fatal** grades of injury. As in Table III (frequency of injury), injury appears to relate to age in some ordered fashion: As "age" increased, minor injuries *decreased,* but both non-dangerous and dangerous-fatal grades of injury *increased.* Minor injuries were sustained by about 69 per cent of injured children, 59 per cent of injured adolescents, and 53 per cent of injured adults. Conversely, non-dangerous injuries were observed among some 23 per cent of injured children, 32 per cent of injured adolescents, and 35 per cent of injured adults. Similarly, dangerous-fatal grades of injury were observed for about 8 per cent of children, 9 per cent of adolescents, and 13 per cent of adults. These increases and decreases proved to be statistically significant ($P = .01$) and not due to mere chance fluctuations.

*For purposes of this paper, "non-dangerous" injuries, subclassified as "moderate" or "severe," are injuries which are painful or disabling, but which do not threaten survival.

**"Dangerous" injury: Injury which places the patient on the hospital "critical" list during the first twenty-four hours. "Fatal" injury is that occurring within 24 hours subsequent to the accident.

Frequency of Body Area Injury (Table V)

Generally speaking, children, adolescents and adults showed a similar *pattern* of injuries among body areas: In each of the three age groups, the head was the body area most often injured; it was followed (with one minor variation) by the lower extremities, upper extremities, thorax, abdomen and, finally, the neck. More specifically, there were marked differences among the three age groups with respect to the *frequency* of injury to the body areas. Children sustained significantly more head injuries than either adolescents or adults. With respect to each of the other five body areas, however, children received far fewer injuries than either adolescents or adults.

The totals in the table yield information on the multiplicity of injury sustained in automobile accidents. The "average" injured child had 1.4 body areas injured, the injured adolescent had 2.0, and the injured adult had 2.2. Thus, not only is automobile accident injury typified by trauma of several body areas, but this multiplicity appears to increase as "age" increases.

Severity of Body Area Injury (Table VI)

Although injured children sustained head injuries more frequently than did older occupants, their head injuries proved to be *less severe;* some 7 per cent more minor (i.e., 7 per cent fewer moderate-fatal grade) head injuries were observed among children.

As stated previously, with the exception of the head, injured children were injured less frequently in each body area than were older occupants. With respect to the *severity* of body area injuries other than the head, no such consistency was observed.

Moderate-fatal grades of injury to lower extremities were seen among some 9 per cent more children than older occupants.

Upper extremity injuries were similar in severity for children versus adolescents and adults combined.

Injury to the other three body areas (i.e., thorax, abdomen and neck) followed a consistent pattern: Children injured in each of these areas sustained significantly fewer moderate-fatal grade injuries than did either adolescents or adults.

Injury Frequency According to Seat Area and Age Group (Table VII)

It has been shown that as gross "age" increased, both frequency and severity of injury also increased. It is now our intention to examine in somewhat greater detail of age whether these phenomena persist. Table VII records injury data for three progressive age groups of children and compares these with adolescents and adults.

Three types of injury measurement were used: frequency of injury among total occupants, frequency of moderate-fatal injury among total occupants, and frequency of moderate-fatal injury among injured occupants. The reason for this plurality of measurement is to test the consistency of the hypothesis stated above: increasing age associates with increasing injury.

As a further check of the hypothesis, a well established control variable was introduced: the seat areas occupied. Previous crash-injury studies have clearly indicated that the frequency and severity of injury varies according to seated position. Thus, if the hypothesis is correct, it should apply to each seat area of the cars.

Comparison was made for the following seating area categories: (1) driver; (2) center and right front; (3) rear; (4) "unusual." The categories are self-explanatory, with the exception of the one designated "unusual"; this is an omnibus category including persons who were standing or reclining, lap-carried or carrying other occupants, fourth occupants of three-passenger seats, occupants of the center bank of seats in station wagons, or otherwise atypically seated.

For each seat area (i.e., driver, center and right front, rear and "unusual") as "age" increased, injury also increased. This observation was consistent and statistically significant for all three types of injury measurement used. In addition, it was observed that even among children, increasing "age" associated with increasing injury frequency. For example, among occupants of the center and right front seat area, 61 per cent of the under-four group were injured, as opposed to 63 per cent of the four to seven group, and 70 per cent of the eight to eleven year group. Extending the comparison to include adolescents and adults, the injury frequency continued to increase; 78 per cent of adolescents in this seat area sustained injury, and 84 per cent of the adults.

The validity of the control variable—the seat area—was equally confirmed: For each age grouping, the frequency and severity of injury was lower for rear seat occupants. Similarly, the "rear" seating category showed less frequent and severe injury than the "unusual" seat category; further, there was some evidence that "unusual" seating was more dangerous than front area seating as well. However, the relatively small volume of "unusual" seating data preclude the degree of subclassification needed for further instructive examination.

Seat Area Occupied by Age Groups (Table VIII)

It has been demonstrated that injury increases with "age," but varies according to seat area occupied. This suggests that the injury experience of the various age groups is likely to be influenced by the frequency with which these age groups occupy given seat areas. The data as seen in Table VIII confirmed this suggestion. For example, the rear seat —demonstrated to be the "safest" seat area—was occupied by more than 50 per cent of the 4-7 and 8-11 year age groups, but by only 29 per cent of adolescents and 12 per cent of adults. Moreover, the center and right front seat area—more hazardous than the rear seat area—was occupied by roughly 29 per cent of the 4-7 and 8-11 year age groups, but by only 42 per cent of adolescents and 32 per cent of adults. A further observation was that the youngest category of all—infants of ages up to and including three years—tended to occupy more hazardous seat areas than did older children. If this pattern were altered, the injury experience of the entire child age group could be expected to drop even further below that of adolescents and adults.

DISCUSSION AND INTERPRETATION

Two factors influencing the favored position of children with respect to injury experience have been identified. One of these is age itself, or at least some physiological characteristic which is associated with age—height or weight, for example. It is obvious that we can do nothing to alter these characteristics *per se,* although we may learn by further study how to take them into account.

The other factor is seating area occupied, a factor which lends itself to modification and control. For one thing, we can encourage fuller or more frequent use of the "safer" seats. For another, we can attempt, through design engineering, to modify the less "safe" areas, making them resemble more closely the "safer" ones. Already available for use, in this connection, are seat belts and protective padding. In the process of providing better protection for our children by these means, we incidentally cannot fail to better our own risk situation.

These two factors—age and seating area occupied—are by no means the only ones to be considered. Other factors, both known and unknown, must also be reckoned with as influences on the injury pattern. The present study has not attempted to take into account, for example, the specific influence of speed on child injury patterns. Though it was clinically observed that the presence of children in the cars studied may have caused the driver to operate at somewhat reduced speed, it is unlikely that the observed differences in speed were as influential as was seated position. Similarly, front-end collisions (more than 60 per cent of injury-producing accidents) affect front seat occupants more significantly than rear seat occupants, and since children so frequently are rear seat occupants, their injury patterns are undoubtedly influenced by this factor to some degree.

Such factors as speed and area of impact—as well as others, such as type of accident, make, year and body style of car, etc.—will be considered in an extended and more detailed followup of the present study. Past crash-injury studies have pointed up certain other areas of interest which, while outside the scope and purpose of this report, may have bearing on future studies of child injury.

One of these is the question of ejection which undoubtedly had some influence on the milder injury pattern observed among children. It is known that ejection has a profound influence on injury frequency and severity; it is noteworthy that rear seat occupants have far less risk of ejection than do front seat occupants, in part because

some 50 per cent of cars registered are 2-door models. Again, the fact that children so often occupy rear seats is possibly of significance here.

Another known factor to consider is the physical law governing the kinetic force of masses of unequal weight: All other things being equal, a heavier body is decelerated with greater force than a lighter body. In this connection, children will behave as lighter bodies; whether ejected or not, they will develop less force during deceleration than will older, heavier persons. For this reason, their injury experience will be both less frequent and less severe.

This paper, while it has dealt with injury in terms of frequency, severity and body area injured, has not attempted to examine the possibility of different injury *types* among child occupants and others. A future study will compare various age groups in terms of types and degrees of lacerations, fractures, internal injuries and other types of trauma sustained in various body areas. A study of the type described might provide physicians with more precise knowledge of automobile accident trauma in epidemiological terms.

SUMMARY

The data of this report were drawn exclusively from non-pedestrian accidents occurring on rural or open highways. These accidents involved 14,520 passenger automobiles in each of which at least one occupant was injured. The total number of occupants exposed to possible injury was 31,925, and 31,001 of these occupants were of known age. *Injured* occupants of known age totalled 23,475. All findings summarized below were statistically confirmed:

1. The proportion of children in injury-producing accidents is markedly lower than the proportion of the national population which they represent.
2. Children in automobile accidents are injured less frequently and less severely than adolescents and adults. As "age" increases, the frequency and severity of injury also increase.
3. Head injuries are somewhat more frequent among children than among adolescents or adults; injuries to other body areas are less frequent among children.
4. Children's head injuries are milder than those of older persons; their lower extremity injuries are more severe; injuries to upper extremities are roughly the same in severity for children and others; thoracic, abdominal and cervical injuries of children are milder.
5. In each seating area of the car, injury increases with increasing age.
6. In each age group, injury associates in the same fashion with seat area occupied; rear seats are "safer" than all others, and front seats are "safer" than "unusual" seats.*
7. The data suggest that the comparatively mild injury experience of children can be further reduced by exploiting the protective aspects of rear seat positions.

*See footnote to Table VII.

TABLE I

Injury-Producing Rural Automobile Accidents

General Data

Data Source	14,520 automobiles in which crash injuries were sustained
Total Occupants	31,925
Total Occupants of Known Age	31,001
Total Injured Occupants of Known Age	23,475
% of Occupants Injured	75.7

TABLE II

A

Injury-Producing Rural Automobile Accidents

Age Group of Population

	Percentage of Total Population
Children	8.8
Adolescents	15.5
Adults	72.8
Age Not Reported	2.9
Total	100.0

B

U. S. Census Population

Age Groups of Population

	Percentage of Total Population*
Children	22.7
Adolescents	10.1
Adults	67.3
Total	100.0

*Based on extrapolations from 1950 census figures.

TABLE III

Injury-Producing Rural Automobile Accidents

Frequency of Injury by Age Groups

	Children	Adolescents	Adults
Not Injured	47.8	28.7	20.5
Injured	52.2	71.3	79.5
Total	100.0	100.0	100.0

TABLE IV

Injury-Producing Rural Automobile Accidents

Severity of Injury Among Injured by Age Groups

Degree of Injury		Children		Adolescents		Adults	
	Minor	69.4		58.9		52.5	
Non-Dangerous	Moderate	18.1	22.7	23.8	32.1	25.1	34.7
	Severe	4.6		8.3		9.6	
Dangerous and Fatal	Serious	2.2	7.9	3.7	9.0	4.6	12.8
	Critical	2.3		2.3		2.6	
	Fatal	3.4		3.0		5.6	
Total		100.0		100.0		100.0	

TABLE V

Injury-Producing Rural Automobile Accidents

Frequency of Body Area Injured (Among Injured Persons)

Body Area Injured	Children %	Children Rank	Adolescents %	Adolescents Rank	Adults %	Adults Rank
Head	77.4	1	69.4	1	69.8	1
Lower Extremities	23.4	2	45.4	2	47.7	2
Upper Extremities	17.9	3	33.6	3	34.9	4
Thorax and Dorsal Spine	11.9	4	26.8	4	38.6	3
Abdomen-Pelvis and Lumbar Spine	8.4	5	14.3	5	16.0	5
Neck and Cervical Spine	3.6	6	5.6	6	9.1	6
Total	142.6		195.1		216.1	

TABLE VI

Injury-Producing Rural Automobile Accidents

Severity of Body Area Injury

Body Area Injured	Children Minor Injury	Children Moderate-Fatal Grade Injury	Adolescents Minor Injury	Adolescents Moderate-Fatal Grade Injury	Adults Minor Injury	Adults Moderate-Fatal Grade Injury
Head	69.9	30.1	62.5	37.5	61.5	38.5
Lower Extremities	66.6	33.4	79.0	21.0	75.1	24.9
Upper Extremities	75.1	24.9	78.5	21.5	74.6	25.4
Thorax and Dorsal Spine	70.7	29.3	64.0	36.0	52.0	48.0
Abdomen-Pelvis and Lumbar Spine	59.0	41.0	54.7	45.3	46.2	53.8
Neck and Cervical Spine	53.8	46.2	45.5	54.5	37.4	62.6

TABLE VII

Injury-Producing Rural Automobile Accidents

Injury Frequency According to Seating Area and Age Group

Age Group and Seat Area	Frequency of Injury among Total Occup.	Frequency of Mod.-Fat. Grade Injuries among Total Occup.	Frequency of Mod.-Fat. Grade Injuries among Inj. Occup.
Driver Area			
Age to 3 yrs.	...	...	...
Age 4-7	...	...	...
Age 8-11	...	...	...
(Total Children)	...	...	...
Age 12-18 (adolescents)	75.2%	27.5%	36.6%
Age 19 or more (adults)	79.3%	32.3%	42.0%
Cent. or Rt. Ft. Seat Area			
Age to 3 yrs.	60.9%	11.7%	19.2%
Age 4-7	63.0%	15.0%	23.8%
Age 8-11	70.2%	18.5%	26.3%
(Total Children)	64.4%	14.8%	23.0%
Age 12-18 (adolescents)	78.1%	30.2%	38.6%
Age 19 or more (adults)	84.3%	35.5%	42.1%
Rear Seat Area			
Age to 3 yrs.	41.9%	8.8%	21.1%
Age 4-7	43.9%	9.3%	21.1%
Age 8-11	50.9%	12.2%	24.0%
(Total Children)	46.3%	10.4%	22.4%
Age 12-18 (adolescents)	59.2%	18.4%	31.1%
Age 19 or more (adults)	67.9%	23.7%	34.9%
Unusual Seated Positions*			
Age to 3 yrs.	44.9%	14.7%	32.7%
Age 4-7	48.7%	15.6%	32.0%
Age 8-11	55.0%	15.3%	27.9%
(Total Children)	47.6%	15.0%	31.6%
Age 12-18 (adolescents)	58.4%	19.7%	33.7%
Age 19 or more (adults)	76.2%	31.1%	40.7%

*Lap Seated, Carrying on Lap, Reclining, Standing, Center Seat of Station Wagon, etc.

TABLE VIII

Injury-Producing Rural Automobile Accidents

Area Occupied by Age Groups

Seat Area	Children to three years	Children 4-7 years	Children 8-11 years	Adolescents 12-18 years	Adults 19 years and over
Driver	...	...	...	26.1	54.5
Center and Right Front Seat	33.9	28.9	29.7	41.7	32.0
Rear Seat	27.1	54.8	57.8	28.7	11.7
Unusual Seat	39.0	16.3	12.5	3.5	1.8
Total	100.0	100.0	100.0	100.0	100.0

A STUDY OF THE RELATIONSHIP BETWEEN DRIVING RECORDS, FIELD DRIVING PERFORMANCE AND LABORATORY DRIVING PERFORMANCE OF PROFESSIONAL AUTOMOBILE DRIVERS

by William E. Tarrants

Introduction

A major obstacle confronting experimenters in driver behavior research is the lack of an adequate measure of driving performance. While different investigators have used various types of criteria, none have been found completely satisfactory.[9] Considerable work has been done in the evaluation of the driver in the actual driving situation. A basic problem in research of this type is the lack of control over environmental conditions and the difficulty of obtaining an adequate objective measurement of driving ability. It appears that a study of the relationship between various possible criteria of driving performance, including laboratory measurement techniques, should be a first step toward the objective of developing a better understanding of driver behavior.

In a practical sense, immediate application can be made of an understanding of driver behavior in the area of predicting professional driver success. Discussions with taxicab companies have pointed out the necessity for being able to predict driver performance at the time of selection. The high turnover rate among taxicab drivers, coupled with the high accident rate in this population, indicates a great need for a method of driver selection which will provide a potentially long-term driver who will have a minimum number of accidents. With a lower turnover rate, more attention can be given to safety training programs with a certainty of a greater return from the training investment over a longer period. The cost of taxicab accidents can easily reach gigantic proportions when consideration is given to such items as increased vehicle insurance rates, increased injury compensation premiums, and law suits resulting from personal injuries associated with taxicab accidents. It would be profitable, therefore, to develop a better understanding of driver behavior so that the present capability of predicting the success of professional drivers can be improved.

The intent of this study is to examine the relationship between various measures of driving performance of professional automobile drivers. The study was designed to evaluate the Auto Trainer driving simulator to determine its usefulness as a laboratory criterion of driving performance, and to examine other potential measures of driving ability. An experiment was conducted to establish the relationship between driving records, field driving performance, and laboratory driving performance of professional automobile drivers.

This study was supported in part by the Ohio State University Grant-in-aid program.

Subjects

Twenty taxicab drivers were used as subjects.* The reasons for the choice of taxicab drivers were as follows: (1) these drivers were mostly professionals with relatively constant habit patterns of driving performance; (2) records of driving performance, accidents, and other biographical information were available for each driver; (3) current driving exposure time was relatively constant for each driver; (4) it was believed that the presence of an observer in the automobile would have less influence on the driving performance of professional drivers than on any other driver.

A sample of 25 subjects was initially selected at random from a population of 100 taxicab drivers made available by a taxicab company in Columbus, Ohio. It was anticipated that some of the drivers selected in the random sample would leave the company during the study. A check of the driver turnover rate revealed that 15 out of 100 drivers could be expected to quit during a six month period. The 25 subjects were selected by means of a table of random numbers, then the first 20 subjects selected were tested as long as they were available. When any of the first twenty subjects were lost, the 21st, then the 22nd subject, and so on, was picked up and tested until a total of 20 subjects were observed. Actually, four subjects out of the original sample of 25 were lost during the two month test period. It was assumed that this method minimized possible error in random sampling caused by the unavoidable loss of subjects during the testing period.

After the sample was selected and the subjects were

*The author is grateful to the management and drivers of the Northway Taxicab Company, Columbus, Ohio, for their generous cooperation in this study.

tested, the subjects' biographical data was examined. It was found that the sample selected provided a good range of age, experience, number of accidents, and other individual characteristics of the subjects. The biographical data ranged as follows: Age, 23 to 54 years; professional driving experience, 0.25 to 32 years; length of service with the company, 1 to 25 months; and number of accidents, 0 to 11. None of the subjects had previous experience on the Auto Trainer driving simulator. Among the 25 subjects chosen at random, 11 were day drivers and 15 were night drivers. Out of the 20 subjects actually used in the sample, 9 were day drivers and 11 were night drivers.

Apparatus

The experimental apparatus basically consisted of an automobile simulator called an Auto Trainer, presently manufactured for use in driver training programs.[8] The Auto Trainer used was a 1956 model with a standard manual gear shift. The Auto Trainer is a composite driving performance test consisting of the full-size conventional controls of brakes, accelerator, transmission, clutch, and steering wheel. The foot controls and the transmission determine the speed and direction of movement of a traveling roadway painted on a moving belt. The relationship of a miniature car to this roadway is determined by the steering wheel. The transmission provides three forward speeds and reverse, and a speedometer gives readings in miles per hour. A bucket-type seat is provided, which may be adjusted to suit the leg room requirements of individual subjects. Twelve instruction signs are presented to the driver in succession by means of a revolving drum operated automatically by the movement of the belt. A new sign is presented after each complete revolution of the belt. The instructions are presented in a sequence as follows:

Begin Cycle
Drive in Low Gear
Drive in High Gear
Drive at 20 MPH
Turn left at 2
Back from 5 to 4, then proceed
Turn Right at 2
Stop for Railroad at 6
Park Parallel at 1
Drive at 40 MPH
Speed Limit 50 MPH
End of Cycle, Proceed at 20 MPH

The apparatus is designed so that the subject's performance is not recorded when the instructions "End of Cycle, Proceed at 20 MPH" and "Begin Cycle" are presented. A miniature traffic light located in front of the subject at eye level is actuated by the experimenter six times during each driving cycle. A driving cycle consists of twelve revolutions of the belt, with scores recorded during ten of these cycles.

Four measures were obtained from the instrument: (1) time taken to complete each cycle, (2) time taken to respond to the red traffic light, (3) the ability of the subject to keep the car in the center of the correct traffic lane, and (4) the total number of driving errors observed by the experimenter. The time taken to complete each cycle appears on a dial located on the side of the Auto Trainer. One unit is counted for each 1/10 minute required to complete a cycle. Thus, a reading of 55 indicates 5.5 minutes total cycle time. Six reaction time trials are given during each cycle. The final reading on the dial gives the average reaction time in hundredths of a second. In measuring steering ability, one unit is counted for each six inches of travel during which the miniature car is kept in the center of the traffic lane.

A driving error check list was used as a guide for detecting driving errors. The driving errors listed on the form included: failure to follow sign instructions, driving off of the road, failure to shift through all three gears after stopping, failure to stop for a red light, failure to drive at the indicated speed, shifting gears without using the clutch, each backing operation performed in excess of two while parking, and miscellaneous errors. Miscellaneous errors included such actions as shifting from low gear into reverse gear without stopping, shifting from high gear into low gear without stopping, stopping unnecessarily, failing to release the parking brake, and driving the car off of the belt. It was assumed that all errors were weighted equally.

An advantage of the Auto Trainer is that the direction of movement and position of the miniature car can be controlled by the subject. The car can be turned either left or right along the 2 foot belt and the belt can be moved beneath the car either forward or backward to give the illusion of car movement in those directions. The speed relationship between the road and the car can be changed by the subject by simply depressing or releasing the accelerator. The car can be stopped and started by the subject at any time and the change in gear ratio controlled by the gear shift and clutch provides a degree of realism similar to actual automobile operation.

A major disadvantage of this simulator is the difference in spatial relationship between the operation of the Auto Trainer and the operation of the actual car. With the Auto Trainer, the driver is positioned outside of the automobile looking down on the miniature car and roadway, while in the operation of an actual car, the driver is positioned inside of the car looking out at the driving scene. Another disadvantage in comparison to an actual car is the lack of proprioceptive feedback of information from the movement of the miniature car to the driver. There is no "feel" of motion, change in direction, or tire drag. The Auto Trainer is essentially a tracking device which requires the subject to change the position of the miniature car according to the movement of the track or roadway.

Method

The subjects were first observed and rated while they operated their taxicabs during normal driving duties. These same subjects were then tested on the simulator. This testing sequence was chosen in order to reduce possible bias due to prior knowledge of the subject's simulator scores by the rater.

Practice in using the rating scale was obtained by observing the performance of five taxicab drivers not included in the population sampled. The company manager was asked to pick out the two "best" drivers, the two "worst" drivers, and an "average" driver safety wise from among the drivers of a local subsidiary taxicab company. The rating of these drivers provided the rater with practice and allowed him to develop a frame of reference for his ratings.

The subjects' "on the road driving performance" was measured by means of a rating scale called the Rogers-Lauer Driver Rating Inventory. This scale has been under development for 20 years by Dr. A. R. Lauer, Director of the Driving Research Laboratory at Iowa State College. The scale is divided into two parts. Part one covers 12 behavior categories assumed to be largely inherent. There are five descriptive phrases in each category. The rater checks the phrase which he believes to be most characteristic of the driver's performance. Each phrase has a numerical weighting and the sum of the numerical weights constitutes the score of part one. Part two is concerned with the degree of skill shown in the performance of certain functions considered basic to automobile driving. Fifteen items are rated on a seven point scale. The sum of the scale values constitutes the score of part two. The total score is the sum of the scores of parts one and two of the scale. Lauer has reported a split-half reliability of .90 for his scale.[9]

Each subject was observed performing in actual driving situations for a period of from one to two hours, depending on the amount of his driving activity. No ratings were made during the first one-half hour to allow the driver time to become adjusted to the presence of the rater and to allow time to explain the study of the driver and answer his questions. Then, after a driver was observed in the actual driving situations, arrangements were made for him to visit the laboratory at the University and operate the simulator.

Preliminary studies were conducted on the Auto Trainer for the purpose of developing performance curves which could be used in determining the number of cycles required to attain learning proficiency. In this preliminary study, as well as in the actual study, the four sub-scores on the Auto Trainer were given to the subjects at the end of each cycle as an incentive for improving their performance. The preliminary learning study indicated that approximately six cycles of operation were required for a driver's performance curve to reach its asymptotic limit. The preliminary studies also indicated a need for a rest period after the fifth cycle, with a one-cycle readjustment period following the rest period. Based on information obtained from these preliminary studies, a ten-cycle driving period was selected, with the actual score based on the mean of the scores obtained during the last four driving cycles. The four sub-scores obtained from the Auto Trainer were then weighted according to values derived by the simulator designer.[1] A composite score was obtained for each subject by combining the weighted subscores according to the following equation:

$$\begin{aligned}\text{Final Score} = {} & 50 \times \text{Steering Score} \\ & -19.5 \times \text{Reaction Time} \\ & -18 \times \text{Total Time} \\ & -12.5 \times \text{Errors}\end{aligned}$$

Biographical data including accident records, age, professional driving experience, and convictions for traffic law violations was collected for each driver by a research as-

TABLE I

SUMMARY OF DRIVER SCORES AND BIOGRAPHICAL DATA

Subject Number	X_1 Rogers-Lauer Rating Total Score	X_2 Auto Trainer Subscores (Raw Scores) Steering	Reaction Time	Total Trip Time	Errors	X_3 Auto Trainer Composite Score (Weighted)	X_4 Age	X_5 Professional Driving Experience (Years)	X_6 Length of Service with Company (Months)	X_7 Convictions for Traffic Law Violations	X_8 Number of Accidents (Total)	X_9 Number of Responsible Accidents	X_{10} Accident Rate (No. Responsible Accidents Per Mo. of Service)
1	122	67.7	126.2	39.7	42.2	—318.5	54	32	25	1	11	4	0.16
2	144	98	66	36.2	10.5	2829.0	29	11	15	0	0	0	0
3	109	128	84.7	37.5	18.7	3838.0	52	30	25	0	0	0	0
4	121	147.5	71	37.2	3	3295.0	54	30	13	0	6	3	0.1
5	92	106.5	75.2	28	25.5	3112.37	31	1	1	0	0	0	0
6	102	153.2	67	48.2	8.5	5381.25	23	.25	3	1	0	0	0
7	95	137.7	85.5	45.7	13.2	4231.12	52	22	3	0	0	0	0
8	93	152	87.2	45	6.5	5007.37	36	1.5	1	0	0	0	0
9	98	141.7	90.5	42.7	21	4290.75	35	8	3	0	0	0	0
10	103	153.5	68.5	41.5	9	5484.62	27	2	4	0	0	0	0
11	107	143.7	83	44.5	9.5	4649.25	52	28	12	0	0	0	0
12	78	132.7	74.5	40.7	13	4288.62	49	10	25	0	9	2	0.08
13	138	149	52.5	40	10	5581.25	36	20	1	1	0	0	0
14	113	137.7	73	38.5	7.7	4669.12	31	8	7	0	6	1	0.143
15	128	153.5	78.7	38.7	7.2	5318.25	31	6	2	0	2	1	0.5
16	128	152	76.5	39	12.2	5262.62	44	3	14	2	4	0	0
17	145	141.2	82.5	39.5	20.7	4482.12	43	13	23	0	2	1	0.043
18	149	116.2	106	56	19	2075.5	51	31	25	0	5	0	0
19	84	149.2	59.7	38.7	10	5474.8	36	5	15	0	7	2	0.133
20	127	176	62.2	44.7	3.5	6986.88	32	3	11	0	3	1	0.09
Mean ($\bar{X}$)	113.85	136.85	78.52	41.10	13.52	4296.97	39.90	13.24	11.40	.2	2.75	.75	.0062
Range (R)	78 to 149	67.7 to 176	59.7 to 126.2	28 to 56	3.0 to 42.2	—318.5 to 6986.88	23 to 54	0.25 to 32	1 to 25	0 to 2	0 to 11	0 to 4	0 to 0.5
Variance (σ^2)	430.82	631.23	27.26	4.96	8.23	2455262.60	105.78	134.35	84.67	.303	12.09	1.36	.01379

sistant. To avoid bias, the experimenter who rated the subjects did not have prior knowledge of their biographical data either at the time they were rated or when they were tested on the simulator.

Problem

The major problem was to determine the relationship between performance on the Auto Trainer driving simulator and actual driving performance, using the Rogers-Lauer Driver Rating Inventory, accident records, driving experience and other biographical data as criteria. In pursuit of a solution to this problem, several sub-problems were defined. The ultimate solution to the basic problem then became the composite of the solutions to the several sub-problems. These involved finding the relationship between:

1. Rogers-Lauer Driver Rating Inventory Scores and Auto Trainer composite scores.
2. Rogers-Lauer Driver Rating Inventory scores and Auto Trainer steering scores.
3. Auto Trainer composite scores and responsible accident rates (number of accidents per month of service).
4. Auto Trainer composite scores and age.
5. Auto Trainer composite scores and professional driving experience.
6. Auto Trainer composite scores and number of convictions for traffic law violations.
7. The Rogers-Lauer Driver Rating Inventory or Auto Trainer composite scores and extremes of the accident rate variable.

Results

A summary of the scores and biographical data compiled for each driver is contained in Table I. Included in the summary are Rogers-Lauer scores (X_1), Auto Trainer subscores (X_2), Auto Trainer composite scores (X_3), age (X_4), professional driving experience (X_5), length of service with the company (X_6), number of convictions for traffic law violations (X_7), total number of accidents (X_8), total number of responsible accidents (X_9), and an accident rate based on the number of responsible* accidents per month (X_{10}).

Some indication of the sensitivity of the scores and biographical data obtained from the sample used may be found by noting the range of the variables included in Table I. Rogers-Lauer Rating Inventory (X_1) ranged from 78 to 149 points for the sample selected. Auto Trainer steering scores (X_2) ranged from 67.7 to 176, Auto Trainer composite scores (X_3) ranged from —318.5 to +6986.88, age (X_4) ranged from 23 to 54 years, professional driving experience (X_5) ranged from 0.25 to 32 years, length of service with the company (X_6) ranged from 1 to 25 months, number of convictions for traffic law violations (X_7) ranged from 0 to 2, total number of accidents (X_8) ranged from 0 to 11, number of accidents for which the driver was judged responsible (X_9) ranged from 0 to 4, and the responsible accident rate, defined as the number of responsible accidents per month of service, ranged from 0 to 0.5.

The relationship between the scores tabulated for the subjects on the Rogers-Lauer scale and the composite scores obtained from the Auto Trainer was determined by non-parametric statistical methods. It was judged that conventional parametric statistics could not, in general, be used in the analysis since data obtained by means of the rating scale was considered meaningful only in a ranked or ordered sense.

Kendall's Tau coefficient of correlation was used in the major analysis. Use of this test requires only the conditions of independence between observations, underlying continuity, and at least ordinal measurement of both the x and y variable. The Tau values computed for the various relationships are included in Table II.

TABLE II

SUMMARY OF TAU CORRELATIONS

Variables	*Kendall's Tau*	*Significance Level*
1. Rogers-Lauer scores vs. composite Auto Trainer scores...	—.053	.37
2. Rogers-Lauer scores vs. Auto Trainer steering scores.....	—.0053	.487
3. Composite Auto Trainer scores vs. Responsible Accident Rate	.038	.407
4. Composite Auto Trainer scores vs. age	—.3893	.0082
5. Composite Auto Trainer scores vs. professional driving experience	—.472	.0081
6. Professional driving experience vs. age	.621	.00007

Table II shows that the three Tau values computed from the correlations of Rogers-Lauer scores vs. Auto Trainer composite scores, Rogers-Lauer scores vs. Auto Trainer steering scores, and composite Auto Trainer scores vs. responsible accident rates are not significantly associated in the population from which the sample was drawn. The associations between these variables can be explained as chance happenings. Similarly, this table shows that the three Tau values computed from the correlations of Auto Trainer scores vs. age, Auto Trainer scores vs. professional driving experience, and professional driving experience vs. age are significantly associated in the population from which the sample was taken. The two sets of variables of Auto Trainer scores vs. age and Auto Trainer scores vs. professional driving experience are inversely related, while the two variables of age and professional driving experience are significant with a positive association as predicted.

Since no significant relationships were found in the correlations of Auto Trainer performance vs. accidents, it was decided that a more detailed analysis of extreme groups might possibly reveal whether or not Auto Trainer scores and Rogers-Lauer scores are sensitive in distinguishing between those drivers who are grouped as relatively good in terms of accidents and those drivers who fall into the relatively poor category. In effect, this was a test of the validity of these two measures, using accident experience as a criterion.

The composite Auto Trainer scores were separated into

*Responsible here means that the driver was judged by the company to have been responsible for the accident.

categories according to three methods of division used to establish the extremes of the accident rate variable, the accident rate variable being defined as the number of accidents per month of driving experience with the company. The two categories in each of these methods of division were as follows:

(1) Drivers with an accident rate = 0 vs. drivers with an accident rate > 0.

(2) Drivers with an accident rate ⩾ .08 vs. drivers with an accident rate < .08 (this division was chosen so as to roughly equalize the total months of driving experience between the two groups).

(3) The five drivers with the highest accident rates vs. the five drivers with the lowest accident rates (the drivers with the lowest accident rates were selected on the basis of longest length of service without accidents with the company since the five lowest rates all equalled zero).

The Rogers-Lauer scores and the composite Auto Trainer scores of the two groups within each of these three divisions were compared. It was assumed that the composite scores obtained from the Auto Trainer have the characteristics of an interval scale and therefore the data were analyzed using the "t" test. Since the conditions for the "t" test could not be made for the Rogers-Lauer score comparisons, a non-parametric test was used for comparing these variables. The Median Test combined with the Fisher's test was chosen for this purpose. The summary of t-tests of extreme groups is included in Table III.

TABLE III

SUMMARY OF THE t-TESTS OF EXTREME GROUPS

Composite Auto Trainer Scores	*Computed t values*	*Significance Level*
Drivers with accident rate = 0 vs. drivers with accident rate < 0....	.05	.9
Drivers with accident rate ⩾ .08 vs. drivers with accident rate < .08...	—.106	.9
Five drivers with highest accident rate vs. five drivers with lowest accident rate	—.035	.9

When the Rogers-Lauer scores for these same variables were analyzed by the Median and Fisher's Tests, it was found that the observed data was not significantly related at the 2-tailed .10 level.

An analysis of the number of convictions for traffic law violations received by each of the 20 drivers in the sample during the year 1958, along with the performance scores of all the drivers, revealed that neither the Rogers-Lauer Driver Rating Inventory nor the Auto Trainer scores distinguished between those drivers in this sample who had been convicted for a traffic law violation and those who had not.

Interpretations and Conclusions

This study revealed that what other experimenters have considered as criteria of driving performance cannot, in fact, be accepted for the population sampled. No significant relationship was found between the scores assigned to observed drivers on the Rogers-Lauer scale and the performance of these drivers on the Auto Trainer. Similarly, there was no relationship between Rogers-Lauer scores and the accident experience of these same drivers. This leads to the conclusion that the Rogers-Lauer Driver Rating Inventory leaves much to be desired as a measure of driver performance, if accident records are accepted as a criterion.

This study has revealed that the Rogers-Lauer scale is not suitable for use in the rating of professional drivers. The scale is apparently not predictive over the relatively narrow skill range found in the professional driver population. Many of the phrases used appear to have been designed for beginning driving students and do not apply to professional driver populations. There is much overlapping of the skills included in the scale, with no specific definitions for these skills. Traits such as "attitude" are difficult to evaluate and mean different things to different raters.

There was no significant relationship between composite Auto Trainer scores and the responsible accident rates of the drivers. The accident rates were further broken down into extreme categories to determine if the Auto Trainer could distinguish between drivers whose rates were among the highest and lowest in the population. Neither the Auto Trainer nor the Rogers-Lauer scale could make a significant distinction between the drivers placed in the extreme categories. It was concluded that neither the Auto Trainer nor the Rogers-Lauer scale is sensitive to differences in the actual driving performance of the drivers in this population as measured by differences in accident rates.

The comparison between Auto Trainer scores and age revealed a significant inverse relationship. The younger drivers were generally more alert and were able to adjust more quickly to the manipulative requirements of the Auto Trainer. The older drivers were not able to adapt themselves so quickly to the different spatial relationship and thus were not able to attain the level of proficiency reached by the younger ones.

The results of previous studies of driver performance in which the Auto Trainer and Rogers-Lauer scales were used is seriously questioned. Lauer, Suhr, Allgaier tested various subjects on the Auto Trainer, including professional drivers, and then rated their actual driver performance by means of the Rogers-Lauer scale. In the Lauer et al. study, the Rogers-Lauer scale ratings were used as the primary criterion against which the potential predictive value of the Auto Trainer subscores were validated. The findings of the present study raise serious questions concerning the use of the Rogers-Lauer scale as a driving performance criterion.

The problem of finding a valid criterion still remains as a serious obstacle to the measurement of driver performance. The question of what constitutes "good" driver behavior must be answered in terms of the many variables associated with the continually changing interrelationships between man and his environment. A sensitive measure of driver performance is needed which is reliably related to a well-defined criterion of successful driver behavior. The problem of validating a driving simulator involves relating

it to the extremely complex patterns of stimulation present in the actual driving situation, where accurate measures of what we are trying to predict are almost totally lacking. It is essential that the factors affecting the validity of rating scales and driving simulators be thoroughly investigated. Only then can conditions be set up which will be conducive to producing the highest possible validity with these measures.

The results of this experiment lead to the conclusion that neither the Rogers-Lauer scale nor the Auto Trainer is suitable for use in measuring the actual driving performance of professional drivers for research purposes. Research should be conducted to evaluate other existing potential criteria of driving performance and to ultimately develop a satisfactory criterion which will be useful in future driver behavior research.

Suggested Future Research

A proposed research program for determining the relationship between other field and laboratory measures of driving performance might extend along two lines. One involves the development and use of an instrumented automobile, and the other involves the development of an instrument which will provide a valid measure of driving performance in the laboratory.

The instrumented automobile might consist of a regular commercially manufactured automobile equipped with special instruments designed to objectively measure factors in driver performance, such as separation distance, braking distance, steering wheel movement, acceleration rate, corner steering ability, and various reactions to the external stimuli present in the actual driving situation.

The laboratory measure of driver performance might consist of a closed circuit television system developed along the lines of the driving simulator proposed by the Cornell Aeronautical Laboratory in their November, 1958 feasibility study.[15] Instead of attempting to reproduce as much of the real driving situation as possible in the laboratory, as proposed by Cornell, it appears that a more practical approach would be to carefully define the variables in the driving situation which are important to driving performance, study man's perception of these variables, and then concentrate on reproducing only those variables which influence driver behavior. The variables thus defined should be reproduced in a form which will result in their correct perception by the driver.

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TRAFFIC SAFETY RESEARCH PROJECTS

Annual Listing

BELOW is a list of research projects of which the National Safety Council has knowledge. Some of these projects are still in the process of completion, some have been already completed, and some have been recently published.

Each project has been classified by a library classification number, used by the Bureau of Highway Traffic at the Yale University. Each number is a subdivision of a principal heading. The headings are as follows:

000 General
100 Road Users
200 Vehicles
300 Fixed Facilities
400 Traffic Characteristics and Controls
500 Law
600 Education
700 Administration
800 Economics and Sociological Aspects
900 Planning

The title is in quotes, previous publication journals and dates are indicated when known, the name and address of the institution where the research is being conducted follows, with the name of the principal investigator. Cooperating or sponsoring agencies are also mentioned when known.

Short summaries of many of these projects are available, but more complete information can be obtained from the institute or individual doing the research.

New reports of research will be abstracted and presented in this journal in the earliest possible edition. Each year the March issue will contain a revised listing similar to the one below of all research projects that have been received during the preceding year.

In-Process:

101 "Case Studies of One Car Accidents Involving Young Drivers"—Hwy. Traffic Safety Ctr., Michigan State U., East Lansing, R. W. Bishop, Asst. Professor, Teacher Educ. Ed.D. Thesis, NYU. Apr. 59.

101 "Driving Behavior and Traffic Accidents"—Transportation Institute, U. of Michigan, Ann Arbor, B. D. Greenshields, Asst. Dir. Jun. 59.

101 "California Accident Repeater Driver Study"—Dept. of Psychol., U. of Southern California, Los Angeles 7, J. P. Guilford, Principal Investigator; D. H. Schuster, Asst. Apr. 58.

101 "An Evaluation of the Road Test Phase of the Driver Licensing Examinations of the Various States"—Center for Safety Educ., NYU, Washington Square, New York 3, F. McGlade. Doctoral dissertation. Jun. 59.

110 "Driver Rehabilitation Through Small Group Discussion"—Drivers Safety Service, Inc., 298 Broadway, New York 7, M. L. Henderson, Dir. of Research; R. Plutchik. Oct. 59.

"A Status Report Concerning Driver Rehabilitation in New Jersey—A Preliminary Statement," Sept. 21, 1959, AAMVA Annual Conf., Portsmouth, N. H.

123 "Skill Decrement in Continuous Driving"—Hwy. Traffic Safety Ctr., Michigan State U., East Lansing, A. M. Barch, Asst. Prof. of Psychol.; T. W. Forbes, Asst. Dir. for Research. Nov. 58.

130 "Causes of Auto Accidents of Adolescent Drivers"—Children's Hospital, Boston 15, Mass., J. R. Gallagher, Chief, The Adolescent Unit; and Harvard School of Public Health, R. C. Moore, Research Assoc. in Indus. Hygiene. Jan. 58.

130 "Voluntary Medical Questionnaire—Memphis and Shelby County Medical Society"—Memphis Police Dept., Memphis, Tenn., J. C. Legg, Traffic Inspector. Mar. 59.

130 "Investigation into Theoretical Models of the Accident Phenomenon"—Indus. Engrg. Dept., Ohio State U., Columbus, T. H. Rockwell, Asst. Prof. Dec. 56.

130 "Impact Attenuation in Protection Against Concussion"—Snell Memorial Foundation, 2315 Stock-

ton Blvd., Sacramento 17, Calif., G. G. Snively, Dir. of Research; and C. O. Chichester. 1959.

131 "Prevalence of Visual Deficiencies in the Driving Population"—Comm. on Motorists' Vision & Hwy. Safety, AOA, 4030 Chouteau Ave., St. Louis 10, Mo., H. W. Hofstetter, Div. of Optometry, Indiana U., Consultant. Jun. 58.

131 "A Comparison of Visual Performance of Driver-Educated Trained and Untrained Drivers in Massachusetts"—Mass. Soc. of Optometrists; Mass. Col. of Optometry, 178 Newbury St., Boston, F. N. Ames, P. Piscia. Sept. 58. O.D. Degree.

131 "Research in Night Vision for Automobile Driving" —Div. of Optometry, Indiana U., Bloomington, H. W. Hofstetter et al. July 60. Contemplated. Sponsor: Amer. Optometric Foundation, Spartanburg, S. C.

210 "Design and Material Analysis of Automotive Safety Equipment" School of Civil Engg., Purdue U., Lafayette, Ind., N. W. Butzow, under direction of L. W. Wood. Feb. 59. Sponsor: U. S. Auto Club.

216 "Safety Devices for Automotive Vehicles"—Inst. of Technology, Mech. Engg. Dept. U. of Minnesota, Minneapolis 14, J. J. Ryan. Apr. 59.

217 "Study of Electronic Devices as Traffic Aids"— Engg. Exper. Station, Ohio State U., Columbus, T. H. Rockwell, O. W. Mintzer, R. Cosgriff, E. Damon. July 59. Contemplated.

402 "Operational Route Analysis"—Traffic Div., Connecticut State Hwy. Dept., P.O. Box 2188, Hartford 15, B. M. Rudy, Sr. Hwy. Engr. 1957-1960.

422 "Warrants for and Effects of Speed Zoning in Suburban Areas"— Joint Hwy. Research Proj., Purdue U., Lafayette, Ind., C. M. Elmberg, under direction of H. L. Michael. Dec. 58. Sponsor: Indiana State Hwy. Dept.

470 "The Effectiveness of an Emphasis Patrol by the Illinois State Highway Police in District 10 on a Selected Highway"—Dept. of Health and Safety Educ. Lab., College of Physical Educ., U. of Illinois, Urbana, J. Payne, Asst.; W. J. Huffman, Asst. Prof.; A. E. Florio, Prof.; and J. T. Henry, Lieut., District 10. Jan. 60.

470.1 "A Study of the Interaction of the Driver, the Highway and the Vehicle in Highway Accident Causation"—Engg. Exper. Station, Ohio State U., Columbus 10, R. F. Baker, Prof. of Civil Engg.; and R. W. Bletzacker, Research Assoc. Nov. 59. Contemplated.

470.1 "Research on Fatal Highway Collisions"—Dept. of Legal Med., Harvard Med. School, Boston, Mass., A. L. Moseley, Research Assoc. Nov. 58.

470.1 "Freeway Traffic Accident Analysis and Safety Study"—Hwy. Research Board, 38th Annual Mtg., Jan. 59. Texas Transportation Inst., A. & M. College of Texas, College Station, B. F. K. Mullins, Proj. Supvr.; C. J. Keese, Head, Hwy. Design & Traffic Engg. Sec. Jan. 1960 or 1961.

473 "Relationship Between Hour of Day and Causal Factors in Minnesota Motor Vehicle Traffic Accidents"—Hwy. Safety Div., Minn. State Hwy. Dept.; St. Paul 1, J. T. St. Martin, Research Analyst. Oct.-Dec. 59.

475 "Locating Slippery Pavements from Accident Reports"—Joint Hwy. Research Proj., Purdue U., Lafayette, Ind., V. G. Stover, under direction of H. L. Michael. Mar. 59. Sponsor: Indiana State Hwy. Dept.

611.2 "The Measurement of Effective Teaching in Driver Education"—Safety Education Proj., Teachers College, Columbia U., 120 St., New York 27, W. G. Anderson, Research Asst. Sep. 58.

611.2 "Effect of Training on Attitudes, Violations, and Accidents in Adolescent Traffic Violators"—Accident Prevention Program, U.S. Public Health Service, Dept. of Health, Educ. & Welfare, Washington 25, D. C., B. H. Fox. Sep. 57.

640.1 "Relationship of Visual Skills to Driving Performance Among Police Officers"—Indiana U., Bloomington, H. W. Hofstetter, Div. of Optometry; J. A. Mears, Dept. of Police Admin.; B. I. Loft, Dept. of Health & Safety. Dec. 58.

700 "The Political Process in the Auto Sub-Culture: A Research Design in Safety Problems"—Govt. Dept., Grad. Schl. of Arts & Sciences, NYU, Washington Square, New York 17, H. H. Wakeland, Two Tudor City Place, New York 17, Jan. 59. Master's Thesis.

844 "The Economic Costs of Motor-Vehicle Accidents" —Planning Div., New Mexico State Hwy. Dept., P.O. Box 1641, Santa Fe. Oct. 56-Jun. 60. In coop. with: USBPR.

Completed:

101 "An Investigation of Adolescent Attitudes Toward Safety"—School of Education, Indiana U., Bloomington, Rita E. Bergman, Box 347, Houston, Ohio. Doctoral dissertation. July 1959.

101 "Driver Behavior: A Study of Personality Characteristics"—U. of Minnesota, Minneapolis; Safety Div., Minn. Hwy. Dept., P. L. Brown, Masters thesis. Jan. 59.

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101 "Attitudes, Emotions, Accidents" — *Traffic Quarterly,* Apr. 59, Eno Foundation, Saugatuck, Conn. Transportation Inst., U. of Michigan, Ann Arbor, B. D. Greenshields, Asst. Dir.

101 "Traffic Accidents and Driver Characteristics: A Statistical and Psychological Study"—*British J. of Indus. Med.,* Vol. 16, No. 2, Apr. 59. British Med. Assn., Tavistock Square, London W. C. 1, England; Institute of Occupational Health, Helsinki; S. Hakkinen, Inst. of Technology, Helsinki, Finland. Apr. 59.

101 "The Driving Stimulator"—*Police,* 1958. Institute of Transportation and Traffic Engrg., U. of California, Los Angeles, S. F. Hurlburt; J. H. Mathewson, Asst. Dir. Reprint No. 65. Apr. 58.

101 "The Relationship of Scholastic Achievement to Traffic Citations in the Seattle Public Schools"—U. of Washington, M.Ed. Thesis, 1959. M. M. Knoll, Teacher in Driver Educ., Lincoln H. S.; J. E. Corbally, Adviser.

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110 "An Evaluation of the Effectiveness of Driver Improvement Procedures"—Hwy. Traffic Safety Ctr., Michigan State U., East Lansing, M. W. Chalfant, Schl. of Police Admin.; G. F. King, Dept. of Psychol. Oct. 58. Hwy. Research Board, Annual Mtg., Jan. 59.

110 "A Study of Pre-Clinic and Post-Clinic Accident and Violation Records of Drivers Processed by the Accident Prevention Clinics of the State of New Jersey" —Drivers Safety Service Inc., 298 Broadway, New York 7, H. L. Henderson, Director of Research. Mar. 58.

121 "The Age Characteristics of Michigan Drivers"—Hwy. Traffic Safety Ctr., Michigan State U., East Lansing, G. F. King, Asst. Prof., Dept. of Psychol. Oct. 58.

130 "The Fallacy of the Term 'Whiplash Injury' "—*Amer. J. of Surgery,* vol. 97, no. 4, Apr. 59. Automotive Crash Injury Research of Cornell U., 316 E. 61 St., New York 21, P. W. Braunstein and J. O. Moore.

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214.4 "Windshield Wiper Blade Icing"—The Anderson Company, Gary, Ind., J. W. Anderson, Pres. June 59.

214.4 "Preliminary Report on Automobile Side Window Glass: A Study of Glass Damage and Associated Occupant Injury in 715 Accidents"—Soc. of Automotive Engrs., Inc., June 58. Automotive Crash Injury Research of Cornell U., 316 E. 61 St., New York 21, B. Tourin, J. W. Garrett, J. O. Moore.

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216 "A Study of Automobile Doors Opening Under Crash Conditions"—Automotive Crash Injury Research of Cornell U., 316 E. 61 St., New York 21, J. O. Moore, B. Tourin. Aug. 54.

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312.2 "An Application of Statistics to Determine the Relationship Between the Frequency on Traffic Accidents and the Width of Paved Shoulders"—Traffic Div., Oregon State Hwy. Dept., Salem, F. B. Crandall, Traffic Engr., Jun. 58.

316.2 "Effectiveness of Symbols for Lane Control Signals" —Hwy. Traffic Safety Ctr., Michigan State U., East Lansing, T. W. Forbes; E. Gervais; T. Allen. Dec. 58. Michigan State Hwy. Dept., Bur. of Public Roads, U.S. Dept. of Commerce, Hwy. Research Board, Annual Mtg., Jan. 59.

316.3 "Driver Needs in Freeway Signing" — Div. of Hwys., California Dept. of Public Works, P.O. Box 1499, Sacramento. Automotive Safety Foundation. Dec. 58.

316.3 "Correlation of Geometric Design and Directional Signing"—Div. of Hwys., California Dept. of Public Works, P.O. Box 1499, Sacramento, G. M. Webb, B. Dentino, R. J. Israel. Jan. 59.

317.2 "Laboratory Study of Skid Resistance"—Joint Hwy. Research Proj., Purdue U., Lafayette, Ind., J. E. Stephens, under direction of W. E. Goetz. Sponsors: Automotive Safety Foundation and Indiana State Hwy. Dept. "A Laboratory Investigation of the Phenomenon of Friction as Applied to Fine-Textured Bituminous Paving Mixtures," Ph.D. Thesis, Purdue U., Aug. 59.

401 "Scientific Aspects of the Road Traffic Problem"—*J. Indian Roads Congress,* Vol. XXII, Part 3, Dec. 57. Central Road Research Inst., New Delhi, India, T. S. Khanna, Paper No. 204.

410 "Quality and Fundamentals of Traffic Flow"—Hwy. Traffic Safety Center, Michigan State U., East Lansing, A. D. May, Jr., Assoc. Prof., Civil Engg. July 59.

412 "Variability of Fixed Point Speed Measurements" —The Traffic Inst., Northwestern U., Evanston, Ill., Proj. No. 4-18, May 59, R. P. Shumate, Assoc. Dir. of Research; R. F. Crowther, Research Div. In coop. with: Wisconsin State Hwy. Patrol; U.S. Bureau of Public Roads.

415 "A Mathematical Model for Highway Traffic"— "En Matematisk Modell For Landsvagstrafik"— Sartryck. Nordisk Matematisk Tidskrift. Band 5. Oslo, Norway, 1957. Dept. of Mathematics, Uppsala U., Uppsala, Sweden, L. Carleson.

415 "Some Geometric Design Considerations for Non-Urban Highways With Mixed Slow and Fast Traffic" —Central Road Research Inst., New Delhi, India, T. S. Khanna, Asst. Dir., Traffic. Aug. 57.

415 "Effect of Bullock Cart on Motor Vehicle Flow on Two-Lane Highways"—Central Road Research Inst., New Delhi, India, T. S. Khanna, Asst. Dir., Traffic. Aug. 57.

422 "Questions and Answers Relating to Speed Limits and Speeds in Iowa"—Iowa Dept. of Public Safety, Des Moines 19, C. O. Swanson, Chief, Research & Statistics. Sep. 58.

431 "Highway Visibility in Fog"—*Illuminating Engg.,* Vol. LII, No. 12, Dec. 57. Dept. of Elec. Engg., Pennsylvania State U., University Pk., C. Marsh, Assoc. Prof. Sponsor: Illum. Engg. Research Inst.

432 "Timing of Traffic Signals for Mixed Slow and Fast Traffic"—*Road Research Bulletin,* No. 3, Apr. 57. Central Road Research Inst., New Delhi, India, T. S. Khanna.

434 "Traffic Acccident Experience Before and After Pavement Edge Line Painting"—Bur. of Traffic, Ill. Div. of Hwys., Springfield, A. J. Cope, Statistical Engr. June 59.

436 "Railing Barriers on Busy Road Intersections (Before and After Study)"—*J. Indian Roads Congress,* Vol. XXIII, Part 1, Nov. 58. Central Road Research Inst., New Delhi, India, T. S. Khanna.

460.2 "A Study of Government Office Employees' Transport Problem in New Delhi"—Central Road Research Institute, New Delhi, India, T. S. Khanna, Asst. Dir., Traffic, and Traffic & Transport Consultant, Delhi Administration. Apr. 59.

470 "Effect of Increased Patrol on Accidents, Diversion, and Speed"—Wis. State Patrol; U.S. Bureau of Public Roads; The Traffic Institute, Northwestern U., Evanston, Ill., R. Shumate. 1958. Res. Proj. R 13.

470 "Evaluation of Available Traffic Accident Records"—Georgia Dept. of Public Health, 12 Capitol Sq., S.W., Atlanta 3, J. C. Terrell, Dir., Biostatistics; H. C. Steed, Jr., Dir., Accident Prevention Sec. Aug. 59.

470.3 "Motor Vehicle Accidents — All Facilities — 1st Quarter 1959"—Traffic Engrg. Div., Port of N. Y. Authority, 111 Eighth Ave. at 15 St., New York 11, L. E. Bender, Chief. May 59.

470.3 "Driver Record Study—1958"—Div. of Drivers Licenses, California Dept. of Mtr. Vehicles, P.O. Box 2590, Sacramento 12, I. Samuels, Admin. Analyst. Oct. 58.

470.32 "An Epidemiological Approach to the Control of Automobile Accidents: Experimental Patrol Intensification at a Military Base"—Dunlap and Associates, Inc., 429 Atlantic St., Stamford, Conn., T. S. Irby and H. H. Jacobs. Apr. 58. Sponsor: Office of Surg. Gen., Research & Development Div., Dept. of the Army.

471.2 "Alcohol and Highway Fatalities"—*Am. J. of Forensic Sciences,* 3, 65-71, 1958. Office of Chief Medical Examiner, 700 Fleet St., Baltimore 2, Md., H. C. Freimuth, Toxicologist; S. Watts, Chemist; R. S. Fisher, Chief Medical Examiner.

471.2 "The Relationship of Drinking and Speeding to Accident Severity"—*Hwy. Research Abstracts,* Vol. 29, No. 9, Oct. 59. Office of Safety Dir., Minnesota Dept. of Hwys., 1246 University Ave., St. Paul 4, Study No. 885.A13.

511 "A Review of Point Systems with Recommendations for Administration Procedures"—Driver Educ. & Acc. Records Div., N. C. Dept. of Mtr. Vehicles, Raleigh, W. N. Hyde, Director. Dec. 58.

610.1 *"Handbook for Motorists"*—C. Hetschko, Attorney at Law, Frankfurt am Main, Beethovenstr. 51, Germany. Apr. 59.

610.1 "Environment, A Factor in Safety Education"—A. W. Stewart, P.O. Box 1492, Lakeland, Fla. Feb. 59.

610.1 "Safety Education—Beyond Three Dimensions"—A. W. Stewart, P.O. Box 1492, Lakeland, Fla. May 59.

611.2 "Effects of Training on Driving Performance of Youthful Drivers in Iowa"—Iowa State College Library, Ames; D. H. Soule, Coordinator, Div. of Field Services, Eastern Michigan College, Ypsilanti, Mich. Masters thesis. 1950.

611.2 "A Study of the Relationship Between Driving Records, Field Driving Performance, and Laboratory Driving Performance of Professional Automobile Drivers"—Safety Research Lab., Dept. of Indus. Engg., Ohio State U., Columbus, W. E. Tarrants, Center for Safety Educ., NYU. July 59.

611.21 "Factors of Educational Value for Obtaining Safe Night Driving Speeds"—Research & Statistics, Iowa Dept. of Public Safety, Des Moines 19, C. O. Swanson, Chief; Driving Research Lab., Iowa State College, Ames, A. R. Lauer, Director. Jan. 58.

614.1 "Effect of an Accident Reduction Campaign"—Iowa Dept. of Public Safety, Des Moines, C. O. Swanson, Chief, Research & Statistics; A. R. Lauer, Dir., Driving Research Lab., Iowa State College, Ames. Dec. 58.

811 "California Vehicle Registrations and Drivers Licenses, 1946-1958"—Research & Statistics Sec., California State Dept. of Motor Vehicles. July 59.

813 "What Per Cent of Drivers and Owners of Motor Vehicles Being Operated on Iowa Highways Are Insured in a Manner That Will Comply With the Requirements of the Iowa Financial and Safety Responsibility Act of 1954?"—Iowa Dept. of Public Safety, Des Moines 19, C. O. Swanson, Chief, Research & Statistics. Jan. 59.

844 "Motor Vehicle Accident Characteristics and Analysis"—Iowa Dept. of Public Safety, Des Moines 19, C. O. Swanson, Chief, Research & Statistics, Jan. 59.

844 "Economic Cost of Motor Vehicle Accidents"—Utah State Road Comm., 525 W. 13th South, Salt Lake City, G. Mathews, Research Engr.; C. Bertolina, Special Studies Mgr.; D. Andreason, Statistician; et al. Mar. 58. In coop. with: USBPR.

Errata

Roger G. Stewart makes the following corrections in his article, *Non-Collision Fatal Accidents: How Many Can Be Prevented?*, which appeared in December: p 27, col. 2, 1 46/Curved road, *Dry* surface, Darkness; p 28, Table 2, footnote/LIGHT conditions (*L*) as Light (L) or Darkness (D).

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